THE UNIVERSITY OF ALBERTA

# ARCHAEOLOGY OF THE PEACE HILLS AREA OF CENTRAL ALBERTA, CANADA

by

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A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF MASTER OF ARTS

DEPARTMENT OF ANTHROPOLOGY

EDMONTON, ALBERTA

SPRING, 1969

UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "Archaeology of the Peace Hills Area of Central Alberta, Canada" submitted by E. Fraser Taylor in partial fulfilment of the requirements for the degree of Master of Arts.

ABSTRACT

This report presents the results of an archaeological investigation of the Peace Hills in central Alberta, in which the problem was to determine the environmental and cultural situation of the aboriginal population during the prehistoric period. Data and procedures from such disciplines as geology, geomorphology, palynology, pedology, zoology, and archaeology were utilized. The landform features and radiocarbon dates on ice margin retreat demonstrate a certain sequence of events that occurred before the Peace Hills sand dunes were built up by wind action over 7,000 years B. P. The earliest artifacts from the Peace Hills belong to Plano people of the Cody Complex. Prior to, or during, the formation of the Peace Hills, earlier Plano people, who made projectile points like Agate Basin and Angostura, were in the general area probably hunting big game animals. Faunal and cultural remains from the Peace Hills indicate a continued reliance on the hunting of big game, principally bison, from 7,000 years B. P. up to the Historic period. Pollen analyses and soils types indicate a floral pattern change from forestation (ca. 10,000 years B. P.) to increased grasslands (ca. 7,000 years B. P.) to forestation of the Parklands type (ca. 4,000 years B. P.), the latter continuing with little change to the present day. Faunal remains and artifact types from the Peace Hills demonstrate that a Plains way of life was followed. Nevertheless, for part of its existence, the area was Parkland, a transitional zone between the Plains and the Boreal Forest.

## ACKNOWLEDGMENTS

The author wishes to thank a number of people who contributed their time, knowledge, and energy in working on the Peace Hills project.

The land on which excavations took place changed ownership over the four years of work and the author is grateful for the co-operation of the various owners, Messrs. B. Fullerton, M. Lawrence, K. J. Armstrong, the County of Wetaskiwin and the City of Wetaskiwin.

To the many people who took part in the excavations go special thanks. Unfortunately some of the names from the first season of excavation went unrecorded. The bulk of the excavation was done by members of three archaeological classes. These students who freely gave their time and energy were Marilyn Ashton-Smith, Evelyn Barr, Helen Dixon, Helen Habgood, Thelma Habgood, Lynn Hanley, "Dev" Hurlburt, Eleanor Lypowy, Mary Stratton, Annemarie Willkom, Mary Young, Lorne Ashton-Smith, the late Fred Coe, Terry Dafoe, Bob Douglas, Jack Elliott, Gordon Finlay, Les Floen, Reg Flowers, Claude May, Jack Merrigan, Walter Nacuk, Stan Reynolds, Al Steedsman, Wray Steedsman, and Erwin Weiler. Other volunteers who aided immeasurably were Dr. Ruth Gruhn, Trudy Nicks, Dr. L. A. Bayrock, Dr. Alan L. Bryan, Rob Bonnichsen, Karl MacDonald, John Osmundson, William Procter, Norman Procter, Ted Reimchen, Elaine Wade and Ross Thomson.

Particular thanks must go to Thelma Habgood, "Dev" Hurlburt, Terry Dafoe, and Stan Reynolds for their continuing aid beyond the actual excavation. Stan Reynolds kindly loaned machinery one year to backfill seventeen squares, supplied aerial photos, and made his collection of artifacts available for comparison. Terry Dafoe, over

the years, has taken on much of the work of classifying and checking material recovered, and has also aided in the photographic work. His searching comments and suggestions have been of immense value to this report.

The author is especially indebted to his advisor, Dr. Alan L. Bryan. His stimulating guidance over the years, coupled with his willingness to let one operate independently, made the Peace Hills investigation an infinitely pleasurable learning experience.

To Edith Stodola, go thanks and appreciation for her labors in typing this report, keeping an ever-alert eye to the lapses in form, and grammar.

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# INTRODUCTION

## Record of Excavation

This report contains the results of an archaeological investigation conducted in the Peace Hills area of central Alberta, Canada (52° 59' north latitude, 113° 24' west longitude; see Fig. 1). The hills were named for the signing of a peace treaty between the Cree and Blackfoot Indians in A. D. 1867. On the most easterly hill of the area a cairn was erected (see Fig. 2a), with an inscription reading:

> Wetaskiwin Spatinow. Erected July 1, 1927,
> in commemoration of treaty of peace made in
> these hills between the Blackfeet and Cree
> Indians 1867.

A nearby city is named "Wetaskiwin", this term being the anglicized version of the Cree expression for "Peace Hills".

Field work was carried out in the late summer and fall of the years 1964 to 1967. Financing was obtained through the Department of Anthropology and Department of Extension of the University of Alberta, Edmonton, Alberta.

In 1964 Dr. Alan L. Bryan of the University of Alberta conducted preliminary excavations at the Fullerton site with his class in archaeology and certain volunteers, including the author. The site was assigned the coding "FfPi100" in accordance with the principles set up by Charles E. Borden (1952) for archaeological site designation in Canada.

In 1965 and 1966 the author conducted excavations at the

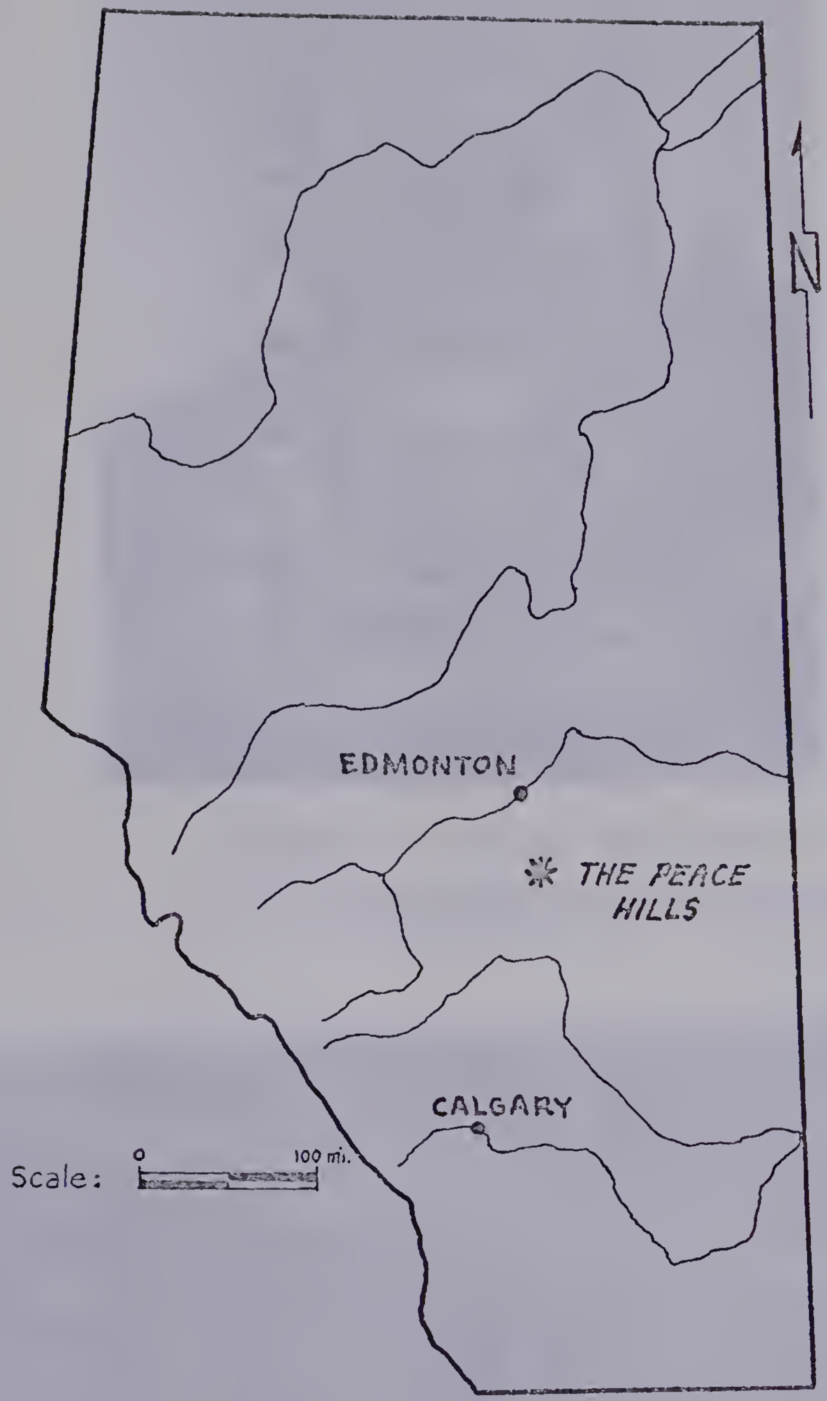


FIGURE 1. THE PROVINCE OF ALBERTA, CANADA.

FIGURE 2a. PEACE HILLS CAIRN.

FIGURE 2b. FULLERTON SITE, 1966 EXCAVATIONS.

same site with two archaeology classes (Fig. 2b). The following year saw limited test excavation at a nearby site and an extensive site survey of the Peace Hills area by the author and certain individuals from classes of preceding years.

## The Geographic Setting

The Peace Hills area is situated within the most northwesterly extension of the "Short Summer Humid Continental" region of North America (Heintzelman and Highsmith 1963: Chapter 10). This region extends in a zone between 42° and 50° north latitude from the Atlantic coast westwards to enclose the Great Lakes and eastern halves of North and South Dakota. From there the region extends in a northwesterly direction to include south Saskatchewan and south-central Alberta. Winters are long and cold, and summers are short and warm. Extremes of temperatures are fairly common, summer highs occasionally reaching 90°F., and winter lows occasionally dropping to -40°F. Wind velocities are generally under 10 m.p.h., and the prevailing wind is from the northwest. Specific data for the Wetaskiwin area, which includes the Peace Hills, are as follows:

| | |
|---|---|
| Annual mean temperature in degrees C.: | 2.6 |
| January mean temperature in degrees C.: | -13.8 |
| July mean temperature in degrees C.: | 16.9 |
| Average annual precipitation in centimeters: | 46.4 |
| consisting of snow: | 136.0 |
| rain: | 32.8 |

The Alberta portion of this region is flanked on three sides by other regions. To the north lies the "Subarctic" region (*Ibid*: Chapter 14) with boreal forests, muskeg, lower temperatures, and lower

precipitation. At the southern limits the "Dry Continental" region (Ibid: Chapter 11) commences, with its vast grasslands, higher temperatures, and lower precipitation. To the west is the "Middle Latitude Highland" region (Ibid: Chapter 13), with the Cordilleran forest, foothills and mountains, higher precipitation, and variable temperatures.

## The Geologic Setting

The Rocky Mountains, consisting largely of steeply tilted sedimentary and metamorphic rocks dating back to the Precambrian Era, outline the southwestern boundary of Alberta. The rest of the province, with the exception of a small portion of the Precambrian Shield in the northeast corner, has gently, northeast and east-sloping bedrock formations composed, in the upper portions, of Upper Cretaceous sandstones and shales. Rivers, descending rapidly from the mountains to the Alberta plain, reflect the bedrock slope and drain to the northeast and east.

Approximately one-half of the Alberta plain has glacial or glacially derived material deposited as a veneer over the bedrock. Most common is a glacially deposited undulating "till" blanket of generally low relief; and consisting of gravel, sand, silt, and clay in varying amounts. This deposit varies in thickness from a few centimeters on hilltops to over one hundred meters in ancient buried river valleys. Other deposits are mainly riverine sands and gravels, lacustrine and eolian sand, silt, and clay.

## Glacial and Post-Glacial Events

During the Wisconsin glaciation most of Canada was covered by a thick ice sheet (Flint 1957: Chapter 18). In Alberta the Cordilleran and Laurentide ice sheets combined to make a sheet that may have been as much as 3,000 meters thick (Bryson and Wendland 1968: 10). About 14,000 years B. P. the southern margin of the North American ice sheet began to withdraw northwards as the ice ablated under rising temperatures.

Bryson and Wendland, using existing radiocarbon dates that indicate most recent ice advances and retreats, have constructed an isochron map (Ibid: Fig. 1) that depicts the withdrawal and wasting of the Laurentide ice sheet. There are few radiocarbon dates, but their work suggests that the Peace Hills area became ice-free about 10,500 to 10,000 years B. P. Continued "retreat" finally opened up an ice-free corridor from the northwest Plains to the Arctic about 9,000 to 8,500 years B. P. (see also Bryson and Wendland 1967).

The Laurentide ice front withdrew to the northeast and east in central Alberta, and large lakes continually formed along the ice margin. In general, these lakes were short-lived as the melting ice margin constantly made new drainage channels available. The Peace Hills are situated in the center of the dried bed of one such ice-marginal lake, "glacial Lake Malmo" (Stalker 1960: 42, 45, 91). Varves, those annual graded bands of fine-grained sediment laid down in lakes fed by cold glacial waters, are present in the deeper lake sediments. At the upper levels, however, they are not evident.

Apparently the lake existed and received more normal homogeneous deposits for some time after the ice left the immediate area. These lacustrine deposits, lying on the glacial till, are from 1.5 to 9 meters thick. The lake, at its maximum extent, was about 25 kilometers wide and 55 kilometers long. Its long axis was oriented from northwest to southeast, and the ice formed a dam on the northern and eastern sides. Stalker (Ibid: 91) states that this glacial lake had three major drainage periods: one when the water drained to the southeast while the ice still impounded the lake on its north-northeasterly limit; a second when the water level was high enough to establish a new channel, also to the southeast but into a non-glacial lake; a third when the now-shallow lake slowly drained through hummocky moraine to the east.

The number of years involved from the formation of this lake to its drainage is not known. As glacial lakes are generally short-lived, presumably much of it drained rather abruptly when the retreating ice margin made new drainage channels available. However, the overall low relief of the area with consequent poor drainage channels would tend to keep many sloughs and marshy areas in existence. At the present time there is a small lake and many small sloughs in the area.

Once a major portion of the lake bed had drained and dried sufficiently, winds from the northwest began to move the fine-grained lacustrine deposits. Over most of the lake bed gentle swales and minor deflation basins were created. Closer to the center of the lake bed, where the wind had a longer "fetch" (unobstructed passage of air), more substantial dune features were built. The low longitu-

dinal dunes and various types of parabolic dunes present today were apparently built at this time.

Smith (1949), in his classification of sand dunes, points out that parabolic or U-shaped dunes (curved dunes with wings extending upwind) are slow-moving types found in semi-arid to humid areas. They are built up largely in place, and are quickly stabilized when vegetation gains ascendancy over the wind.

Melton (1940) has done extensive work on dunes of the semi-arid southern High Plains area of North America. He points out that, while most dune features are complex, they can be understood in terms of simple dune feature development subsequently made complex by variations in velocity and direction of the prevailing winds. The simple dune features which he outlines (Ibid: 126-130) that are applicable to the Peace Hills area are those created by winds in conflict with vegetation, and with a deep sand base as a source. His classification and discussion suggests that a certain course of events took place in the Peace Hills area.

Once the lake bed had dried sufficiently, "strong" winds (14 m.p.h. and over) from the northwest (as indicated by the orientation of the parabolic dunes) created "windrift" dunes. These are U-shaped dunes with very long (over one kilometer) parallel wings. The downwind portion of the dune where the two wings join is frequently blown out, leaving two long parallel ridges. Melton points out that these dunes, in contrast to other types, do not seem to be forming anywhere in the world today, as winds are now too variable in direction

and are probably of insufficient velocity (Ibid: 130).

Next in the time sequence are "elongate blowout" dunes which are formed under "moderate" (10-14 m.p.h.) unidirectional winds in conflict with vegetation. The wind excavates a basin and piles up the sand around the lee side. Migration is not as extensive as in the windrift dune, and may actually be upwind as the vegetation gains ascendancy and the wind is unable to lift sand over the dune top.

The most recent forms are the "blowout" or "parabolic" dunes which are created by "gentle" (less than 10 m.p.h.) winds. Vegetation is largely in ascendancy but the wind is still able to act on such bare places as recently drained sloughs and over-grazed areas. The wings and deflation basins are not as elongated as in the previous forms; and migration is almost non-existent, there being only sand movement from the basin to the rim. Build-up is largely in place as the sand is hardly able to pass over the flat crest. Stalker (op. cit.: 47) has determined that the bedding of the Peace Hills parabolic dunes dips only about 5 to 10 degrees from the crest. These parabolic dunes are the highest and bulkiest landform features in the Peace Hills area.

Present day winds are generally under 10 m.p.h. and the prevailing winds are from the northwest, though there are gusty chinook-type winds from the southwest. Probably the dunes were modified slightly by similar gusty-type winds in their last stages of stabilization, as some dune features encroach on others. Some of the more substantial dune features are presented in Fig. 3.

This sequence of dune formation logically follows the picture

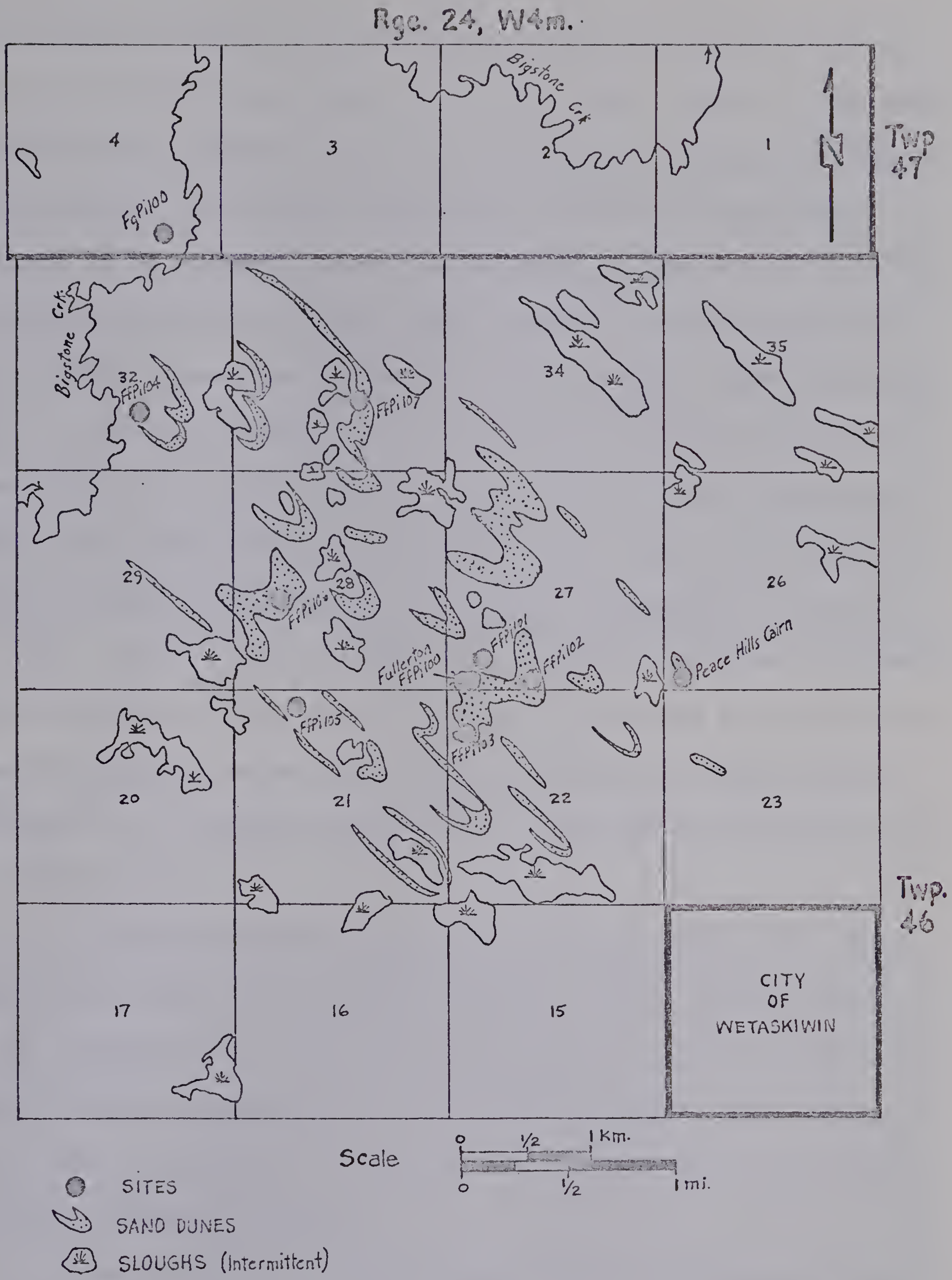


FIGURE 3. SITES AND MAJOR PHYSICAL FEATURES OF THE PEACE HILLS AREA.

of a drying lake bed acted on by unidirectional winds that gradually lost their ability to move sand. This "loss" is, in part, attributable to encroaching vegetation. Once the dunes were stabilized only minor modification by strong gusty winds could take place. The cultural evidence, to be presented later in this paper, suggests that the dunes were largely stabilized by about 7,000 years B. P., with only minor modifications for another 2,000 years. Over the last 7,000 years only about 1.5 meters of sand has accumulated on the dune tops. This slow accumulation, at a fairly constant rate, appears to have been uninterrupted by any significant local climatic event. No old sod lines or erosional surfaces were found in the course of excavation. Stalker (op. cit.: 47) has noted the presence of carbonaceous bands, presumably buried sod lines, in dunes about 50 miles south of the Peace Hills area. Climatic conditions in the Peace Hills either did not allow periodic formation of soil horizons on the dunes, or destroyed the evidence of any soil formation.

Several of the Peace Hills archaeological sites were found at the tops of these large modified parabolic dunes. The Fullerton site is situated on the top of the highest dune (Fig. 4a, b) about 30 meters above the general level of the old lake bottom. The average height of all dune features is about 8 meters, with some of the other parabolics reaching 25 meters.

The eolian nature of the deposits was also demonstrated by a sieve and hydrometer analysis of samples selected from the Fullerton site dune. The results are presented here in Appendix A.

Figure 4a - Fullerton Site (looking west).

Figure 4b - Fullerton Site (looking east).

Pollen Sequence

Hansen (1949) collected peat sections from bogs in central Alberta, and constructed pollen profiles from his analyses. Six of his sites fall within about an 80 kilometer radius of the Peace Hills, the closest being about 24 kilometers distant. The bogs are all of post-glacial age, with the possible and partial exception of one. Predominant in five sections, at all depths, were pollen of boreal forest types such as pine (*Pinus* spp.) and spruce (*Picea* spp.). In smaller amounts were pollen of balsam fir (*Abies balsamea*), aspen (*Populus tremuloides*), and grasses-composites-chenopods. The latter were the most common in the lower middle part of the sections. Poplars, such as aspen and balsam (*Populus tacamahacca*), are likely to be poorly represented in sections as their pollen is not well preserved in peat. By comparing the lower parts of the profile with the uppermost part (representing present-day conditions), some relative statements can be made.

Pine and spruce fluctuate conversely with each other throughout the sections, but with the former always being more common. Hansen suggests that this preponderance of pine pollen may indicate frequent fires. This event apparently allows pine to re-establish itself at the expense of spruce. Pine obtains its maximum at the same time as the grasses-composites-chenopods, and Hansen attributes this fact to a warmer and drier climate during which fires were more common. The maximum development of the grasses-composites-chenopods, and pine, in the lower middle part of the sections is presumably representative of the time when the grasslands, or an increase in grasses, extended through the present Parkland area up into the southern limits of the

Boreal Forest (as indicated by the black soils that are present in those areas today; see Fig. 5). In the upper levels of the profiles there is a decline in the grasses-composites-chenopods, and an expansion of spruce over pine, suggesting a return to a cooler moister climate like that of today.

Assuming that the bogs began to accumulate shortly after the ice left the area, *i. e.*, about 10,000 years B. P., and that deposition was fairly constant (as would seem to be the case as all the sections show similarly developing profiles), then the grasses-composites-chenopods in the Peace Hills area and to the north became more common about 7,000 years B. P. They reached a peak of development about 5,700 to 5,000 years B. P., then assumed the Parkland condition (in existence today) about 3,000 to 4,000 years B. P.

One of Hansen's profiles (*Ibid*: Fig. 2), that which is farthest south and closest to the present-day grasslands (80 kilometers south of the Peace Hills), is different from the others in that the grasses-composites-chenopods are most common when the bog began to accumulate. Then they decline, like the other profiles, to reach a Parkland condition about the upper middle of the profile. This is only one section but it suggests that there was not an extensive forest development south of the ice sheet margin until it had retreated to the Peace Hills area. By this time forest expansion from the Cordilleran and/or eastern areas had commenced.

## Soils, Flora and Fauna

Soils investigations lend additional support to the expanded

grassland model. The black soil zone, which develops under mid-latitude grasslands, extends from the north limit of the present-day grasslands through the Poplar and Parkland areas into the southern limits of the Boreal Forest (see Fig. 5).

The Peace Hills are presently within the Poplar area as defined by Moss (1932). Immediately to the north is the Parklands, which differs in having more frequent and larger stands of white spruce (*Picea albertiana*), balsam poplar (*Populus tremuloides*), white birch (*Betula papyrifera*), and less grassy areas. The two areas are ecotones (areas of transition) between the Boreal Forest and the Prairie. Bird (1961) classifies the general area somewhat differently, and calls Moss's Poplar and Parkland the "Aspen Parkland", but with two biotic communities, grassland and aspen poplar, which correspond roughly with Moss's division. For the purposes of this report the term Parkland, encompassing both communities, will be used.

Soils of the Parkland are characterized by a deep, rich black to dark brown 'A' horizon, and a calcium carbonate deposition 15 cm. thick at about 100 cm. below the surface (Bowser, *et*. *al*. 1947). Rainwater, a weak carbonic acid, removes the calcium carbonate from the upper levels and deposits it at the lower levels of percolation. This area of deposition is grey in color and is frequently highly compact. This phenomenon was present in most of the excavation units at the Fullerton site. Soil is acidic where trees and brush are

present, and neutral where grasses prevail. Because the Peace Hills are grass-covered on the south slopes, and tree-covered on the north, the soil pH value proved to be quite variable over a short north-south distance. Excavation was carried out within the tree-line at the Fullerton site and the soil was found to be quite acid. In all likelihood the tree cover has not been constantly present since the decline of the grasses, or the bone that was found would have been in much worse condition or even destroyed. The fluctuation of spruce with pine in the pollen profile indicates that fires and/or droughts destroyed the trees periodically, allowing a return of the grasses for short periods.

Moss (Ibid: 391) presents evidence for a 20 year cyclical pattern of droughts in this area, dating back to A. D. 1818, during which forest fires were also more common. There is evidence in the journals of explorers such as Alexander Henry (Coues 1897) and H. Y. Hind (1859) that fires were also more common in southern Manitoba and Saskatchewan, being frequently set by the Indians, intentionally and otherwise. With the trees destroyed by fire the grasses were able to establish themselves. However, the Parklands show a vegetational succession toward a forest climax; and the grasses would soon be replaced. Natural and man-made fires in the past probably created substantial grassy areas within the Parklands, allowing large herds of Plains bison to move in at the expense of smaller groups of woodland browsers, at least until the trees managed a comeback.

Trees common in the Peace Hills area today include aspen and balsam poplar (*Populus tremuloides*, *P. balsamifera*, respectively)

and white spruce (Picea glauca). Some of the more common bushes are juneberry (Amelanchier alnifolia), raspberry (Rubus strigosus), red chokecherry (Prunus virginiana), western snowberry (Symphoricarpos occidentalis), dogwood (Cornus stolonifera), and beaked hazelnut (Corylus cornuta). There are over 20 species of the more dominant grasses (see Bowser et. al. 1947: 20), some of which are rough fescue (Festuca scabrella), junegrass (Koeleria gracilis), wheatgrasses (Agropyron spp.), needlegrasses (Stipa spp.), and bluegrasses (Poa spp.).

Mammals common in the area within the historic past were bison (Bison bison bison), elk (Cervus canadensis), moose (Alces alces), mule deer (Odocoileus hemionus), wolf (Canis lupus), coyote (Canis latrans), black bear (Ursus americanus), jack rabbit (Lepus townsendii), Richardson's ground squirrel (Citellus richardsonii), pocket gopher (Thomomys talpoides), beaver (Castor canadensis), badger (Taxidea taxus), weasel (Mustela spp.), striped skunk (Mephitis mephitis), muskrat (Ondatra zibethicus), and porcupine (Erethizon dorsatum). A recent arrival in the area is the white-tailed deer (Odocoileus hemionus). By the latter part of the 19th century bison, elk, and black bear were no longer found in the Peace Hills.

The more common reptiles and amphibians are the common garter snake (Thamnophis sirtalis), tiger salamander (Amblystoma tigrinum), and chorus frog (Pseudacris nigrita).

## Prehistoric Man in Alberta

Archaeological sites with controlled excavation are few in number in Alberta, though this situation is being remedied through the

efforts of the Glenbow Foundation in Calgary, the University of Calgary, and the University of Alberta. Much of our knowledge is derived from surface collections made in the southern part of the province where wind deflation is more common.

For discussion purposes in this report, the generalized terms Paleo-Indian, Meso-Indian, Neo-Indian, and Historic, will be used. This usage follows the practice of most archaeological workers in Alberta, and also in the Northwest Plains area. Wormington and Forbis (1965: 12-13) discuss the reasons for avoiding some of the other classifications, such as Mulloy's (1958) Early Prehistoric, Middle Prehistoric, Late Prehistoric; and Willey and Phillip's (1957) Lithic, Archaic, Formative, etc., for Alberta archaeology. In brief, Alberta archaeology is so little known at the present time that the use of these latter more confining terms, or terms with certain implications, would be inadvisable and, in certain cases, in error for Alberta archaeology. The more general terms Paleo-, Meso-, and Neo-Indian, were apparently first used in 1956 by the Denver Museum of Natural History for a display of archaeological material from Alberta. George Arthur Smith independently developed the terms at the same time and presented them in print in 1957.

Although Alberta archaeology is relatively little known, the evidence indicates that, in the south and central part of the province, a big game hunting way of life persisted with little change up to the time the bison disappeared from the Plains. Artifacts reflect this nomadic existence of small hunting bands. Pottery occurs

only in small amounts and was apparently only made to a limited extent by recent hunters. As a consequence the archaeological story of Alberta is based largely on the projectile point sequences, as compared to those sequences in neighboring areas with dated sites.

The Paleo-Indian stage in Alberta is characterized by well-made lanceolate and sub-lanceolate points used in the hunting of big game animals, mainly bison, that were generally larger than the modern species. The time period for this stage seems to extend from deglaciation to about 6,000 years B. P.

The oldest known artifacts found in the province are three Clovis points of uncertain provenience, one from the Edmonton area and the other two from the extreme south and central part of the province. Two fluted Folsoms have also been found in the southern part of the province, again in uncertain provenience. Southern Saskatchewan exhibits the same situation with five Clovis, two "classic" Folsoms, several crude Folsoms, and other fluted points (Kehoe 1966a). Thus it is not certain that the people making these points actually lived in the southern part of the provinces. Their products may have been picked up farther south and subsequently brought in. Kehoe makes a case for Clovis and Folsom occupation of southern Saskatchewan by virtue of the point location in relation to radiocarbon dated evidence of ice margin retreat.

While there have been limited finds of points such as (or similar to) Agate Basin, Angostura, and Hell Gap, the earliest intensive occupation of south and central Alberta was by people

making Scottsbluff and Eden points (Cody Complex). These latter points are found as far north as the Peace River Country in the northwestern part of the province. Farther north in the Northwest Territories and the Yukon there are also limited finds of the former types of points (Hibben 1943, MacNeish 1956, 1963). Many workers believe there was a gradual northward movement of big game hunters as the ice margin retreated and opened up a corridor to the Arctic region. The Cody Complex people, however, seem largely confined to the Plains region at the time of its maximum extent.

The Bayrock site (see Wormington and Forbis 1965: 116-117), about 80 kilometers north of the Montana border, produced an articulated skeleton of a now extinct form of bison. A chipped cobble was found within the cracked skull. In the same formation, which was possibly laid down in a short time by a glacially-fed stream, were found fragmented bison bones, an Alberta point (either a crude variant of, or "ancestral" to, the Scottsbluff point), some chipped stones, and two spokeshaves. A radiocarbon date of $11,000 \pm 250$ years B. P. (McCallum and Dyck 1960: 75) was obtained on a sample of wood from lower down in the same formation.

About 3 kilometers distant, the Stalker site (Wormington and Forbis 1965: 117-118) produced the fragmentary skeleton of a very young child in a sand deposit overlain by glacial till. Unfortunately there is no dating, and no artifacts were in association.

While Cody Complex material is abundantly represented in Alberta artifact collections, no Cody Complex site has been excavated

and reported on to date in the province. The Fletcher site (Forbis 1968) is an Alberta-Scottsbluff kill and butchering site located near the Montana border. The formation containing the material appears to represent a proglacial lake bed, and it is geologically dated at 7,000 to 11,000 years B. P. The bison bone was highly fragmented but appeared to be of modern species size. The Scottsbluff points recovered exhibited the two types distinguished by Wormington (1957: 267), and there were other somewhat aberrant but seemingly Paleo-Indian types of points. Also in apparent association was a corner-notched point and a portion of a grooved maul.

The Meso-Indian stage is marked by the appearance of notched points. In the Alberta plains area the emphasis was still on the hunting of big game but more certainly of modern species. The increasing usage of plant foods in the Central Plains, apparently made necessary by the increasing aridity of the warm period at about 4,000 to 7,000 years B. P. (see Antevs 1955), does not appear to have a counterpart in the Northern Plains. The Meso-Indian stage may have started as early as 6,000 years B. P. in the Northwest Plains, as the Fullerton and Fletcher sites demonstrate the presence of corner-notched points about the time the modern bison species appeared or became more common in the area.

The next dated projectile point type appearing in the Northern Plains is the Oxbow, named from a site in southeast Saskatchewan (Nero and McCorquodale 1958). Five radiocarbon dates from the type site and the Long Creek site (Wettlaufer and Mayer-Oakes,

_et_. _al_. 1960), also in southern Saskatchewan, range from 3,400±250 years B. C. to 2,670±80 years B. C. Though this point is common in Alberta surface collections, it has not been excavated and reported on to date.

McKean lanceolate points and the related but seemingly more recent Duncan and Hanna points exhibit the same situation. The lanceolates are frequently found with Oxbows in blowout patches. Radiocarbon dating on these lanceolate points in the Northern and Central Plains ranges from 3,650±190 years B. C. to 840±350 years B. C.* While McKean points are associated with milling stones in the more arid Central Plains, this is not the case in Northern Plains sites. Apparently the rising temperature made little change in the way of life on the Northern Plains. Big game hunting continued in the north while the southerners placed increasing emphasis on plant foods, presumably because the big game herds began to avoid the hot and arid high Central Plains.

The Pelican Lake projectile point (Wettlaufer 1955: 54-55), with its deep corner-notches and fine flaking, is common in the Northern Plains, and similar types are found elsewhere. They have associated radiocarbon dates, at the Long Creek site in Saskatchewan, of 1,760±70 years B. C. and 280±100 years B. C. In Alberta, the Old Women's Buffalo Jump site (Forbis 1962a) yielded Pelican Lake-like

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* See Neumann 1967, for a compilation of radiocarbon dates for the Northern and Central Great Plains area.

points with an associated radiocarbon date of A. D. 310$\pm$60 years. Surface collections for central Alberta do not frequently contain this point type and it would appear to have been more common farther east and south.

The Besant projectile point (Wettlaufer 1955: 39-49) has much the same geographic distribution as Pelican Lake points. In southern Saskatchewan they are associated with radiocarbon dates of A. D. 375-325 at the Mortlach site, and A. D. 340-70 years at the Felt site (Kehoe 1964: 52), where it was found with Woodland-type pottery. In Alberta, Besant points are found in surface collections, the lower levels of Old Women's Buffalo Jump (Forbis 1962a), the Kenney site (see Wormington and Forbis 1965: 136-138), and the Muhlbach site (Gruhn 1965).

The Neo-Indian stage is marked by a proliferation of small side-notched point types about 2,000 years B. P., which some workers feel marks the replacement of the spear and atlatl by the bow and arrow. Communal bison drives, pottery, and tipi rings also seem to date from this time. Wormington and Forbis (op. cit.: 196) suggest that an apparent increase in population may have been due to the greater and steadier food supply obtained by the method of driving herds of bison over a cliff.

The small and delicately made Avonlea point, named from a bison drive site (Kehoe and McCorquodale 1961) in southern Saskatchewan, has an associated radiocarbon date there of A. D. 450$\pm$100 years. This point type is the earliest in the "small side-

notched point" system of the Northern Plains, as outlined by Kehoe (1966b). Bison jump sites have yielded large quantities of small side-notched points in various styles. The numbers are sufficient to allow statistical analyses to determine types and trends for the Northern Plains (e.g. Forbis 1962a, and Kehoe 1966b).

The Historic stage of the Northwest Plains commences with the arrival of European imports such as trade goods, the horse, and the European himself. In the Northwest Plains historic contact began during the latter half of the 18th Century. Forbis (1963) has pointed out the gap that exists in our knowledge between the late prehistoric or protohistoric time, and the time when serious consideration of Indian culture began. The initial impact of European culture brought about rapid changes that went largely unrecorded for years. Thus protohistoric sites have proven difficult to link with historically known tribes. The difficulty of finding historic period campsites, even when described in the early journals, plus the fact that all tribes had similar artifact inventories, has added considerably to the problem.

When the first European entered the eastern part of what is now the Province of Alberta (Anthony Henday, in 1754-55), many bands of various linguistic affiliations were roaming widely over this corner of the Northwest Plains (Lewis 1942). The Snake (Shoshoni) and Kutenai were occupying the area between the Red Deer River and the Milk River. The Blackfoot and Gros Ventre were moving south and west into the same area from Saskatchewan. Following close behind

the Blackfoot were the Cree and Assiniboine. About this time the Sarsi came south from the Boreal Forest and shortly became associated with the Blackfoot. Though the European himself was, as yet, largely unknown to these people, the effects of his culture were bringing drastic changes to the aboriginal way of life. Tribes sought to maintain themselves and obtain trade goods from competing fur companies and independent traders. Intertribal raiding, primarily for horses and guns, and excessive hunting was the result. The arrival of the North West Mounted Police in 1873, the establishment of Indian reserves in Alberta in 1876-77, and the near extinction of the bison in the 1880's brought an abrupt end to an ancient way of life.

# CHAPTER TWO

## THE FULLERTON SITE

This report is mainly concerned with the Fullerton site. Of the nine archaeological sites discovered in the Peace Hills, this one seemed to have been most intensively occupied by prehistoric man. The other sites were on smaller dunes at lower elevations.

The Fullerton site is on the area's highest dune, which is also the most southerly of the large parabolic dunes. There is unlimited viewing distance to the south and west. To the north, at the present time, the trees on the dune's own slope are the limiting viewing factor, while to the east the dune on which site FfPi102 is located partially obstructs vision in that direction. But, in brief, the Fullerton dune is the most ideal look-out site in the Peace Hills.

Some of the local people have surface collected for years on a trail that ran over the top of the Fullerton dune. Not until the 1960's, however, did the site become known to archaeologists. At that time the municipality constructed a road that cut through the dune from east to west. A large portion of the dune was removed and transported down into the flat to the west for road fill.

Mr. William Procter, Wetaskiwin District Agriculturalist and member of the Archaeological Society of Alberta, had the opportunity of observing the road cut as the material was removed. He noted the presence of rock flakes in the grey-black sand that provided a "cap" of 80-150 cm. to the yellow sand that constituted the bulk of the dune. During construction he watched for buried soil horizons and rock chips in the basal yellow sand but none were

revealed.

Mr. Procter concluded that the rock chips were likely to be an unnatural occurrence in a sand dune, and that prehistoric man may have been responsible for their presence. He notified Dr. Alan L. Bryan, an archaeologist at the University of Alberta, who shortly verified the fact that the upper part of the dune contained evidence of human occupation of some antiquity. The owner of the land, Mr. Burgess Fullerton, was contacted; and he gave permission to conduct excavations on the limited area that was left after road construction. The site seems to have been about 30 ares (three-quarters of an acre) in extent, but about 92 per cent of this area was removed for road fill to the west.

The site was mapped in the summer of 1964 by Dr. Bryan and an anthropology student, Karl MacDonald. A reference hub was set at 47.5 meters north of the centerline of the east-west road allowance, and 176.5 meters east of the centerline of the north-south road allowance, and the dune was contour mapped (see Fig. 6). Because of the road cut and the desire of the owner to preserve the trees down the north slope, there was left for archaeological excavation a long strip only about 3 meters wide. A base line was established east from the reference hub at an angle of north 101° east. Reference stakes for pits were put in every 2 meters along this line from the reference stake to the east. Pits for excavation, with the base line as the north limit, were then measured. Reference stakes for the pits were those at the northwest corner on the base line. Pits were

labelled as 'A' to 'P' consecutively, from east to west, and other pits were added in subsequent years (see Fig. 7). Each pit was to have a 10 centimeter baulk on all sides.

That fall (1964), after the University of Alberta sessions started, Dr. Bryan took his Anthropology 395 class and a few volunteers, including the author, to the site for weekend excavations. Pits 'A'. 'D', 'G', 'I', 'L' were started. Excavation was accomplished with trowel, brush, and pan, by 10 centimeter levels. All material recovered, other than artifacts and the sand, was placed in level bags. Artifacts were located horizontally by distance south and east of the pertinent reference stake, and vertically by distances below the sod line and below the surface of a recent yellow sand deposit that overlay the sod line in most pits.

Over several weekends, four of the pits were excavated to what was later labelled level 'D', while pit 'L' was excavated lower, into the yellow sand below the grey sand. By this time classwork and the weather required termination of excavation for the season and the pits were backfilled.

The site seemed to represent an intermittent occupation by small hunting bands through Meso- and Neo-Indian times. Unfortunately natural stratigraphy and old soil zones were not discernible throughout the grey and grey-black sand containing most of the cultural material. Cultural "floors" or concentrations of rock material were not evident either, except for the odd narrow lens of charcoal seldom more than a few centimeters long.

In the late summer and fall of 1965 excavations were continued by the author conducting a University of Alberta Department of Extension class in archaeology. The pits previously excavated were reopened and completed into the sterile basal yellow sand. Pit 'L' was taken down deeper into the yellow sand in a fruitless search for more material and sod lines. All pits were augered to an additional 110 centimeters depth as a check for more material. By this time it was evident that there was no cultural material below the uppermost few centimeters of the basal yellow sand. At the end of the season pits 'Ae' (one pit east of 'A') to 'P' were completed.

In 1966 excavations were continued by the author and another Department of Extension class in archaeology. The excavation area was extended east with the addition of pits 'A2e' to 'A6e', and north with pits 'Bn' to 'A2en' (see Fig. 7). Some of the projectile points (2 Scottsbluffs, 2 short lanceolates) now demonstrated that the site probably first saw occupation over 6,000 years ago. The various other identifiable points, such as Oxbow, McKean, and Pelican Lake, indicated the continuing popularity of the dune top as a campsite.

The dune was composed of about 30 meters of culturally sterile yellow sand containing minor amounts of silt and clay. The oldest cultural material first appeared in the uppermost few centimeters of this yellow sand which was much discolored by oxide deposition, rodent holes, and root holes. Occasionally material occurred somewhat lower but always in these rodent and root holes. Pits 'B' to 'Ae' particularly showed this discoloration of the yellow sand, and they

contained the deepest and oldest cultural deposits. The surface contour lines showed a depression extending down the north slope of the dune from these latter pits. Apparently this was a drainage area, and the artifacts in the lower levels have possibly suffered some displacement as a consequence.

Above the yellow sand was a grey sand zone. While in most pits the line of contact between the two sand zones was rather indistinct (with staining from the grey sand "fingering" into the yellow sand), in some of the pits the line represented a discontinuity or erosional surface. In pit 'J' a rodent hole in the yellow sand was neatly truncated by the overlying grey sand. As was later determined, this grey sand was the zone of calcium carbonate accumulation, a part of the soil forming process. Above the grey sand was a grey-black sand with no calcium carbonate accumulation. The boundary between the two was very indistinct. Overlying the grey-black sand, for most of the excavated area, was a layer of humic litter. Prehistoric material was found up to the rather indefinite lower limit of this litter. Higher up in the thin humic layer were found crushed tin cans, and .303 rifle cartridge cases dated 1917 and 1943. Above the humic layer, and over most of the excavated area, was a fresh yellow sand that apparently had blown up from the road cut in the last few years.

The north, south, and west walls of all pits were profile mapped upon completion of excavation (with some exceptions where baulks had been kicked down by nocturnal visitors). The east walls of the most easterly pits, 'A2en' and 'A6e' were also profiled.

To obtain the greatest accuracy possible in plotting artifacts on cross-sections, a new cross-section was constructed to represent the midline of the pits on an east-west line. This was accomplished by interpolation of sand zone depths of the north and south wall profiles, using the west walls as a check. Artifacts were then plotted on this new cross-section by: 1) horizontal location east of pertinent reference stake; 2) vertical location by interpolation, at location south of pertinent reference stake, of their location between the interface of the basal yellow sand to grey sand and the interface of the recent yellow sand to sod line (top of the grey-black sand, or top of the humic litter where present). For interpolation, the depth figure used was that below the reference stake for the artifact in question. Once an artifact was plotted on the midline cross-section, the depth below surface and sod on the cross-section was checked against that recorded for the artifact at the time of excavation. As the midline cross-section is a construct, and recorded depths below surface and sod an estimate (the overlying material being removed in the course of excavation), the check could only be approximate. In practice most differences were under 4 centimeters for surface measure and 8 centimeters for sod measure. Those few artifacts with checking measurements exceeding these figures were not plotted unless the surface and sod measure straddled the depth below reference stake measure. As a further check the whole process was repeated for a north-south midline cross-section for each pit.

Because of the lack of physical stratigraphy throughout the

culture zone, it was hoped that the artifact plot would reveal cultural "floors" or horizontal concentrations of artifacts. Unfortunately no such phenomena became evident. Sand deposits, even with good vegetation cover, allow a certain amount of churning underfoot. In addition there was evidence of abundant rodent and root-growing activity in all pits, with some water activity in the deeper pits. Another problem was the fact that over 6,000 years of occupation was contained within only 60 to 150 centimeters of deposits.

An attempt was made to determine culture levels by artifact typology. However, the few artifact types that could be considered diagnostic proved to be too limited in number to justify extending cultural levels over the entire excavated area. Relative percentages for different types of rocks by depth showed no significant patterns. The quantity of rock flakes by depth was plotted by line graph, and this approach had some limited value: pits 'K' to 'O' had a similar graph for 0-50 centimeters depth, pits 'H' to 'J' for 30-50 centimeters, pits 'E' to 'F' for 0-60 centimeters depth. Again this was not sufficient to establish cultural levels but did suggest that deposition had been fairly constant over much of the site. The presence or absence of foreign rock such as obsidian, Knife River "flint", and certain samples of local rock with unique characteristics also proved to have limited value. Obsidian was present at all depths, albeit in limited numbers; and all flakes had much the same physical appearance. Chalcedony flakes were usually so small that Knife River "flint" could not be safely distinguished from the local brown chalcedony. The local

rocks exhibiting some unusual features (a pink metamorphic quartzite with black inclusions, a blue-green chert with red patination, and a black quartzite) were only found in five pits, 'A3e' to 'A6e' and 'Bn', and at only 10-20 centimeters in depth. These various approaches were combined in another attempt to delineate levels. However, only a small area of the site could be culturally divided, and this division had many uncertainties.

These various pits did demonstrate that the accumulation of sand had been fairly constant over the last 7,000 years for much of the excavated area. A decision was made to divide the cultural sand zone into seven levels, each hopefully representing approximately 1,000 years in time. These were labelled 'A' to 'G', from top to bottom (see Figs. 8, 9). As there appeared to be a slight concentration of cultural material just above and on the interface between the basal yellow sand and the grey sand, the upper limit for level G was set here. All cultural material below this line was considered to be in level G. The upper limit of level A was set at the interface between the humic litter and the grey-black sand. The space between was divided into six equally thick horizontal levels across the excavated area. Judging by the resultant level location of the "type" projectile points, identified and dated at other sites, this procedure worked quite well for most of the site. An exception occurred in pits 'A3e' to 'A5e' where the distribution of pottery sherds indicated that deposition in that area had been more rapid in the last 3,000 years than it had in the previous 3,000 years. The levels for these pits were adjusted accordingly.

These easternmost squares also showed a considerable thinning of the entire sand zone containing the cultural material, thus increasing the chance for error.

With the above mentioned adjustment, the pottery and the "type" projectile points, known and dated from other Plains sites, were found to concentrate in the proper levels, with few exceptions. In some cases a known projectile point "type" would occur in an earlier level, and last to a later level, than what existing radiocarbon dates would indicate for the point's life span. This is no doubt largely due to the arbitrary level designation, but may, in part, also be due to an actual situation: a projectile point type appeared in an area, became more popular over some length of time, and then declined in popularity. Fullerton point types 1b (McKean Lanceolate) and 4a (Oxbow, and Parkdale Eared) demonstrate this "normal curve" of popularity.

The arbitrary levels assigned here were made necessary by the homogeneous nature of the deposit and the lack of any horizontal concentration of cultural material. The levels are divisive units for the purposes of discussion. As such, they constitute a model designed to depict and integrate various types of cultural and environmental data. The greatest weakness of this model is the arbitrary division of the cultural sand zone into equal levels, each purporting to represent about 1,000 years of time. The greatest strength of this model lies in the fact that the sequences bear out, with few exceptions, that which is known about the archaeology of the Northwest Plains.

# CHAPTER THREE

# STONE ARTIFACTS

## Raw Materials

The total rock specimens recovered, exclusive of artifacts, numbered 17,242. Of these, 5,736 were pebbles and cobbles, nearly all fire-cracked, measuring from 0.4 to 12.0 centimeters in diameter. Most were in advanced stages of disintegration due, apparently, to having been subjected to firing several times over. These pebbles and cobbles were mainly quartzites, sandstones, and granitic rocks, all of which are common in the glacial and fluvial deposits of the area.

Flakes derived from the construction of artifacts totalled 11,506. These are summarized by material in Appendix B, and by level in Appendix C.

Quartzite is one of the most common rocks found in Alberta gravels. While highly variable as to flaking qualities, the average quartzite rock can be made into a fairly good projectile point or knife. This was the most common rock type used at the Fullerton site.

The next most common rock type at the site was mudrock. These include argillites, siltstones, and claystones. The more general term "mudrock" was used here in that they all obviously originated from a single bedrock formation; and any individual specimen might exhibit characteristics common to, for example, both argillite and siltstone. Generally speaking, the rocks were the somewhat harder argillite, a slightly metamorphosed siltstone. Slates and shales, being more fissile, were considered separately from the mudrocks. The ultimate

source of these rocks appears to be a bedrock formation of Upper Cretaceous or Paleocene deposits. Mudrocks were not common in the gravels of the immediate area, and it may be that they were obtained directly from exposed bedrock in Battle River and Pipestone Creek about 10 miles to the east. This rock type makes a rather poor artifact, being softer than quartzite and having rather indifferent flaking qualities. However, it was readily available; and could be quickly and easily worked into a tool.

Chert occurs commonly in the river and glacial deposits, in the form of brown and black pebbles and small cobbles. The smaller pebbles required but little preparation to make scrapers and chisel-ended tools.

The rest of the local rocks such as chalcedony, petrified wood, quartz, sandstone, clay ironstone, jasper, agate, chert-chalcedony, shale, and slate are found less frequently in the area; and this fact is reflected by their small numbers at the site.

Obsidian is foreign to the area; and was brought in, possibly from the Cordilleran area. At the Fullerton site this material occurred most commonly as utilized flakes, though there were also some microblades. While not abundant, obsidian was present in all culture levels. Apparently there was a continuing relationship to the Cordilleran region, either through trade or expedition.

Knife River "flint" from North Dakota and/or southern Manitoba (Hlady 1965) appears to be present, in small amounts, in all culture levels except level F. As mentioned earlier, small flakes

proved difficult to differentiate from the local chalcedony. Local chalcedony exhibits many impurities, flaws, and discolorations which become obvious in the larger flakes. Considering the number of artifacts of Knife River "flint" that are found in southern and central Alberta, the Fullerton site appears to be rather anomalous with its small quantity. The converse situation exists for obsidian. Artifacts of this material are very scarce in Alberta collections, while being three times as common as Knife River "flint" at the Fullerton site. This apparent anomaly may be explained by the fact that most of the obsidian artifacts at the Fullerton site were utilized and slightly retouched spall flakes, just the type of artifact that is usually overlooked by surface collectors.

Ochre (limonite and hematite) occurred in small shapeless lumps from 0.5 to 1.0 centimeters in size; and was available as encrustation on the mudrocks in the exposed bedrock of the river valleys to the east. Presumably this material was used as coloring material.

The chipped stone artifacts that were recovered totalled 1,029 specimens. Of these, 844 could be safely plotted as to level (see Appendix D). The remainder were primarily surface finds, with smaller numbers occurring in the destroyed baulks and rodent or root holes. A few had conflicting location data.

Appendix B also lists the waste flake to artifact ratios. The fine-grained silica rocks, such as Knife River "flint", obsidian, chert-chalcedony, were utilized to the ultimate, there being few

waste flakes. Most ratios for the other rock types are under 10:1, a figure which seems rather low. This may indicate that much artifact preparation was done elsewhere, with only the prepared blanks being brought to the site. The outstanding exception to this generalization is quartzite at 25:1, this material obviously being worked at the site. Quartzite was more readily available and abundant than the other rocks, with the exception of mudrock and chert. Chert flakes may be under-represented in the sample because the small dark flakes were hard to detect during excavation. As for the mudrocks, their flaking characteristics are such that fine flaking was difficult to accomplish, and most of the mudrock artifacts were prepared by limited broad shallow flaking.

Projectile Points: (Figs. 10, 11, 12)

A total of 143 projectile points, or fragments of same, were recovered from the Fullerton site. Of these, 108 could be assigned to five main types based on form and notching. Ninety-five of these could be assigned to the established culture levels. Only 34 of the points were in an unbroken condition. Data on the individual specimens are presented in Appendix E, and the relative frequency of the types by culture level is presented as Fig. 10.

Point Type 1: Lanceolate sub-lanceolate, with concave base.

Type 1a: (Fig. 12-n, q).

No. of specimens: 2.

Form: Convex sides coming to a rounded point; bases widely concave; one specimen somewhat waisted.

Technique: Bifacial flaking with broad shallow flakes terminating at the midline; limited retouch; basal thinning; limited basal grinding; lateral edges near base also ground. (Note: one point has two small notches near the tip; one notch has a polish and the projection between the two notches also exhibits polish).

Size range: Length (estimated) 4.0 cm., width 2.2-2.4 cm., thickness 0.6 cm.

Material: 1 chert, 1 quartzite.

Provenience: Level G.

Comparable types: Plainview-like points in Alberta surface collections (Wormington and Forbis 1965: Figs. 19-a, 27-c).

Type 1b: (Figs. 11-l, m, n, 12-d, e).

No. of specimens: 13.

Form: Lateral edges straight to convex; tip rounded or sharp; widest dimension between mid-point and base; base deeply notched.

Technique: Flaking unifacial or bifacial; broad shallow flaking; some retouch; basal notches well-ground, obscuring any flaking details; one point well-polished bifacially; one point with slight side-notching.

Size range: Length 2.2-4.2 cm., width 1.4-2.6 cm., thickness

0.3-0.8 cm.

Material: 4 quartzite, 4 chert, 4 mudrock, 1 clay-ironstone.

Provenience: 1 from level B.

6 from level C.

2 from level D.

2 from level E.

2 unassigned.

Comparable types: McKean lanceolates in Alberta surface collections (Wormington and Forbis 1965: Figs. 11-a, b, c, 17-a, b, c). McKean site, lower level (Mulloy 1954). Pictograph Cave (Mulloy 1958). Cemetery Point site (MacNeish 1958a: 98). Signal Butte 1 (Strong 1935: Plate 25-o).

Point type 2: Stemmed.

Type 2a: (Fig. 12-o, p).

No. of specimens: 3.

Form: (Note: the description will apply largely to the one complete point.) Broad point with sharply curving sides to a sharp tip; inset stem, slightly expanding; one specimen with pointed lateral projection at lower extremity of stem; bases straight to slightly convex.

Technique: Bifacially flaked with broad long scars randomly placed from edge; extensive retouch on blade and stem; basal thinning in short broad flakes; grind-

ing on base and sides of stem.

Size range: (One specimen complete.) Length 3.7 cm., width 2.6 cm., thickness 0.6 cm.

Material: 1 quartzite, 1 chalcedony, 1 Knife River "flint".

Provenience: 1 from level A (picked up and resharpened in recent times).

2 from level G.

Comparable types: Short Scottsbluff points in Alberta surface collections (Wormington and Forbis 1965: Figs. 8-b, d, e, f, 26-e).

Scottsbluff Bison Quarry (Barbour and Schultz 1932).

Claypool site (Dick and Mountain 1960).

Fletcher site (Forbis 1968: Fig. 1).

Type 2b:

No. of specimens: 5.

Form: Convex blade edge coming to a sharp tip; inset stem expanding and rounding to form, with concave base, an "eared" or "fishtail" effect; bases widely and shallowly concave.

Technique: Bifacial flaking with broad shallow flakes in irregular pattern; blade retouch; one specimen with basal thinning; minor basal grinding.

Size range: (One complete specimen.) Length 3.1 cm., width 2.1-2.2 cm., thickness 0.4-0.7 cm.

Material: 2 quartzite, 2 chalcedony, 1 mudrock.

Provenience: 1 from level A.

1 from level B.

1 from level C.

1 from level G.

1 unassigned.

Comparable types: Hanna and Duncan-like points in Alberta surface collections (Wormington and Forbis 1965: Figs. 17-d, 70-a).

Signal Butte 1 (Strong 1935: Plate 25-d).

Pictograph Cave 1, 11 (Mulloy 1958: Fig. 6-11, 31, 32, 33).

Long Creek site, Level 5 (Wettlaufer and Mayer-Oakes, _et_. _al_. 1960: Plate 14-1).

Type 2c: (Figs. 11-k, 12-f).

No. of specimens: 12.

Form: Same as Type 2b but without the "eared" or "fishtail" effect of the base; bases slightly concave (4 specimens), straight (4 specimens), and slightly convex (4 specimens); blade edges slightly convex to strongly convex; one specimen with barbed shoulders.

Technique: Bifacially flaked with broad shallow flakes irregularly spaced; minor blade retouch; stem sides ground and/or worn smooth; 6 specimens with minor basal thinning; bases are ground except two

specimens.

Size range: Length 1.6-3.1 cm., width 1.4-2.1 cm., thickness 0.4-0.7 cm.

Material: 8 quartzite, 2 chert, 1 chalcedony, 1 mudrock.

Provenience: 2 from level A.
1 from level B.
2 from level C.
1 from level D.
2 from level E.
2 from level F.
1 from level G.
1 unassigned.

Comparable types: (These points were difficult to assign to specific types in literature. Their rather broad and nondescript characteristics, combined with generally poor workmanship and great time range, suggest individual fortuitous development.)

Type 3: Corner-notched.

Type 3a: (Fig. 12-k, 1, m).

No. of specimens: 6.

Form: Long blade with gently convex edges coming to a sharp tip; sharp shoulders; narrow neck; long stem; convex base.

Technique: Bifacially flaked with broad shallow flakes

rather irregularly spaced in three specimens, but well-spaced and regular in the other three; all blades retouched; basal thinning by broad shallow flakes; basal grinding not intensive; broad notches ground and well-worn, or polished; one specimen bifacially polished.

Size range: Length (estimated) 3.0-4.5 cm., width 1.9-2.5 cm., thickness 0.5-0.8 cm.

Material: 3 quartzite, 2 chalcedony, 1 mudrock.

Provenience: 1 from level F.
1 from level G.

Comparable types: Fletcher site (Forbis 1968: Fig. 1-o).

Type 3b: (Fig. 12-h, i).

No. of specimens: 2.

Form: Blades triangular with slightly convex sides; shoulders sharp in one and slightly barbed in the other; corner notches deep and broad; straight base; short stem.

Technique: Bifacial flaking with broad but regular flakes on one specimen (other specimen made on thin flake that required only retouch); basal thinning but no grinding; notches ground and well-worn, or polished; one specimen well-polished bifacially, obscuring much flaking detail.

Size range: Length (one specimen) 2.5 cm., width (one specimen) 1.8 cm., thickness 0.4-0.5 cm.

Material: 2 quartzite.

Provenience: 2 from level F.

Comparable types: None found in literature for this time period (ca. 5-6,000 years B. P.) though somewhat similar in form to Type 3c.

Type 3c: (Fig. 11-p, q, 12-t).

No. of specimens: 6.

Form: Triangular blade with straight or slightly convex edge; barbed shoulders; bases slightly convex; notches deep and fairly broad.

Technique: Bifacially flaked with short broad flakes well spaced; blade retouch; basal thinning and minor basal grinding; notches slightly ground or polished.

Size range: Length (estimated) 2.8-5.0 cm., width 2.0-2.6 cm., thickness 0.5-0.6 cm.

Material: 3 quartzite, 2 chert, 1 chalcedony.

Provenience: 5 from level C.
1 unassigned.

Comparable types: Pelican Lake and Keaster points in Alberta surface collections (Wormington and Forbis 1965: Figs. 68-b, 70-g, 72-e).
Mortlach site, Pelican Lake culture (Wettlaufer 1955: Plate 11-1, 2).
Long Creek site, Level 4 (Wettlaufer and

Mayer-Oakes, et. al. 1960: Plate 13-1, 2).

Keaster site (Davis and Stallcop 1965: Plates 3, 4).

Pictograph Cave, Level 11 (Mulloy 1958: Fig. 6-19, 21, 22).

Type 3d: (Fig. 11-u).

No. of specimens: 3.

Form: Lopsided appearance (both shoulders and base angle off the perpendicular to the main axis); blade triangular with straight to slightly convex sides; shoulders sharp; notches deep and wide with little expansion to the base; bases irregularly straight to convex.

Technique: One point bifacially flaked; minor retouch; two specimens basally thinned; some notch grinding; no basal grinding.

Size range: Length 2.5-3.2 cm., width 1.7 cm., thickness 0.4-0.5 cm.

Material: 1 chert, 1 mudrock, 1 quartzite.

Provenience: 2 from level D.

1 unassigned.

Comparable types: Unknown.

Type 4: Side-notched.

Type 4a: (Figs. 11-b, g, h, o, x, y, 12-a, g, j).

No. of specimens: 17.

Form: Blade edge usually convex; bases wide and usually deeply

concave; notches wide and shallow; "eared" effect with the rounded base corners; wide necks.

Technique: Bifacial flaking with broad shallow flakes somewhat randomly detached; three largest points are retouched with long shallow thin flakes reaching center of point; basal thinning by broad deep flakes across entire base; basal grinding minor and on only 3 specimens.

Size range: Length 2.8-5.3 cm., width 1.5-2.5 cm., thickness 0.4-0.7 cm.

Material: 6 mudrock, 5 quartzite, 3 chert, 1 chalcedony, 1 clay-ironstone, 1 chert-chalcedony.

Provenience: 1 from level A.
2 from level B.
4 from level C.
4 from level D.
4 from level E.
1 from level F.
1 from level G.

Comparable types: Oxbow and Parkdale Eared points in Alberta surface collections (Wormington and Forbis 1965: Figs. 11-d, e, 23-g, 25-d, e, f, 63-b, 75-e, f).
Simonsen site (Frankforter and Agogino 1960: Fig. 5-7, 11).

Oxbow site (Nero and McCorquodale 1958: Fig. 5-a, b).

Long Creek site (Wettlaufer and Mayer-Oakes, et. al. 1960: Plates 16-1, 18-2, 3).

Larter site (MacNeish 1958a: Plate VI-8).

Type 4b: (Figs. 11-r, v, w, 12-b, c, s).

No. of specimens: 13.

Form: These differ from type 4a by being narrower, with deeper notches, and with bases only slightly concave, straight, or slightly convex (eliminating the "eared" effect).

Technique: Bifacial flaking ranges from short, broad, and shallow to narrow, thin, and shallow flakes; retouch on 7 specimens; notches ground or worn to a rounded outline but with edge remaining sharp; basal thinning; basal grinding intensive in 5, minor in 8; 3 specimens are bifacially polished.

Size range: Length 2.7-3.4 cm., width 1.5-2.0+ cm., thickness 0.4-0.6+ cm.

Material: 5 quartzite, 5 chert, 1 chert-chalcedony, 1 Knife River "flint", 1 mudrock.

Provenience: 1 from level B.
1 from level C.
2 from level D.
5 from level E.

2 from level F.

2 unassigned.

Comparable types: Alberta surface collections (Wormington and Forbis 1965: Figs. 17-g, h, 25-g, h).

Cemetery Point site (MacNeish 1958a: Plate VII-18, 19).

Long Creek site (Wettlaufer and Mayer-Oakes, *et. al.* 1960: Plate 18-4, 6).

Type 4c: (Fig. 11-e, s).

No. of specimens: 6.

Form: Same as type 4b but with wide shallow notches.

Technique: Bifacial flaking ranges from short, broad, and shallow, with broad shallow flakes irregularly spaced to narrow, thin, and shallow flakes; minor basal thinning; basal grinding in 3 specimens; minor notch grinding in 5 specimens.

Size range: Length 2.6-3.2+ cm., width 1.9-2.7+ cm., thickness 0.4-0.6 cm.

Material: 2 quartzite, 2 chert, 1 petrified wood, 1 Knife River "flint".

Provenience: 1 from level B.

3 from level C.

2 unassigned.

Comparable types: Besant and Besant-like points in Alberta surface collections (Wormington and Forbis

1965: Fig. 23-f).

Old Women's Buffalo Jump (Forbis 1962a: Fig. 14-a to e).

Wahkpa Chu'gn site (Davis and Stallcop 1966: Plate 3).

Type 4d: (Fig. 11-i).

No. of specimens: 6.

Form: Small points with generally convex blade edges; sharp to rounded shoulders; bases straight to concave; notches variable in width and depth.

Technique: Bifacial flaking usually, with broad shallow flakes; retouch limited or not at all present; basal thinning on 3 specimens; minor basal grinding on 4 specimens.

Size range: Length 0.9+ cm.-2.9 cm., width 1.5-1.8 cm., thickness 0.4-0.6 cm.

Material: 5 quartzite, 1 mudrock.

Provenience: 3 from level B.
1 from level C.
1 from level D.
1 from level E.

Comparable types: Prairie Side-notched point (MacNeish 1958a: Plate VII).

Prairie Side-notched point (Kehoe 1966b: Fig. 2-f to l).

Type 4e: (Fig. 11-c, d, f, j, t).

No. of specimens: 9.

Form: Small points with convex blade edges; base is straight and is the widest part of the point; U-shaped notches placed well up from the base.

Technique: Bifacially flaked with broad shallow flakes; 5 with retouch; basal thinning and grinding.

Size range: Length 1.7-2.5 cm., width 1.2-1.5 cm., thickness 0.2-0.4 cm.

Material: 6 chert, 2 quartzite, 1 Knife River "flint".

Provenience: 4 from level A.
2 from level B.
1 from level C.
2 unassigned.

Comparable types: Plains Side-notched point (MacNeish 1958a: Plate VII-4, 5, 6).
Plains Side-notched point (Kehoe 1966b: Fig. 2-a to e).

Point type 5: Ovoid; unnotched, unstemmed (Figs. 11-a, 12-r).

No. of specimens: 5.

Form: One specimen with oval outline; two specimens with ovoid outline but straight based; two specimens trianguloid.

Technique: Bifacially flaked with broad shallow flakes; basal thinning on 4 specimens with the fifth having a "bevelled" end due to a curving of the flake in

the "blank" stage of construction; some retouch; 2 specimens with basal grinding.

Size range: Length 2.6-4.1 cm., width 1.6-2.2 cm., thickness 0.4-0.8 cm.

Material: 3 quartzite, 1 petrified wood, 1 mudrock.

Provenience: 2 from level A.
1 from level B.
1 from level D.
1 unassigned.

Comparable types: Too general to state; in some cases these may be unnotched projectile point blanks or "knives".

Scrapers;

A total of 139 specimens of tools, presumably used for scraping hides and bones, were recovered from the Fullerton site. Of these, 113 could be assigned to the various culture levels. They are distinguished from cutting tools by having steep retouch at one or more lateral edges.

Type 1: (Fig. 13-a, b, d, e).

No. of specimens: 21.

Form: Thick cross-section, ovoid to trapezoid in outline; ventral surface concave to convex, or concavo-convex.

Technique: Made from split pebbles; retouch at end and/or one or two sides (as oriented by long axis); dorsal surface largely unflaked.

Size range: Length 1.7-3.2 cm., width 1.5-2.4 cm., thickness 0.5-0.9 cm.

Material: 19 chert, 1 chalcedony, 1 clay-ironstone.

Provenience: 3 from level A.
4 from level B.
4 from level C.
4 from level D.
3 from level E.
1 from level F.
2 unassigned.

Type 2:

No. of specimens: 3.

Form: Small thick flakes; oval outline; dorsal surface rounded; ventral surface concave (1 specimen) and convex (2 specimens).

Technique: Dorsal surface completely flaked over with small wide flakes; ventral surface untouched.

Size range: Length 1.8-2.4 cm., width 1.3-2.0 cm., thickness 0.6-1.3 cm.

Material: 1 mudrock, 1 agate, 1 chert-chalcedony.

Provenience: 1 from level A.
1 from level C.
1 from level F.

Type 3:

No. of specimens: 13.

Form: Ovoid to rectangular in outline; trianguloid in cross-section due to high ridge extending down length of flake; ventral surface concave (9 specimens), convex (3 specimens), straight (1 specimen).

Technique: Ridge-back flake utilized; steep retouch confined to wide distal end.

Size range: Length 1.6-4.7 cm., width 1.3-2.6 cm., thickness 0.4-1.0 cm.

Material: 6 chert, 3 mudrock, 2 quartzite, 1 agate, 1 chalcedony.

Provenience: 1 from level A.
1 from level B.
3 from level C.
3 from level D.
1 from level E.
2 from level F.
2 unassigned.

Type 4: (Fig. 13-c).

No. of specimens: 46.

Form: Small curved flakes; ovoid to trapezoidal in outline; trapezoidal in cross-section; dorsal surface straight; ventral surface concave (26 specimens) and convex (20 specimens).

Technique: Made on thick curved flakes; ventral surface untouched; dorsal surface flaked to flatten.

Size range: Length 1.4-2.9 cm., width 1.0-2.3 cm., thickness 0.2-0.9 cm.

Material: 17 chert, 12 chalcedony, 6 chert-chalcedony, 6 mudrock, 3 quartzite, 1 Knife River "flint", 1 obsidian.

Provenience: 9 from level A.

6 from level B.

7 from level C.

8 from level D.

4 from level E.

2 from level F.

2 from level G.

8 unassigned.

Type 5:

No. of specimens: 14.

Form: Small thin flat flakes with irregular outline.

Technique: Waste flakes utilized; steep retouch confined to a small area.

Size range: Length 1.0-3.1 cm., width 1.0-2.4 cm., thickness 0.2-0.4 cm.

Material: 5 chert, 2 quartzite, 2 mudrock, 2 chalcedony, 1 jasper, 1 chert-chalcedony, 1 unidentified.

Provenience: 1 from level A.

1 from level B.

3 from level C.

2 from level D.

2 from level E.

1 from level F.

2 from level G.

2 unassigned.

Type 6:

No. of specimens: 5.

Form: Flat or curved cortex flakes with irregular outline.

Technique: Steep retouch, mainly at one end.

Size range: Length 2.3-3.8 cm., width 1.8-2.8 cm., thickness 0.3-0.9 cm.

Material: 3 chert, 1 quartzite, 1 petrified wood.

Provenience: 1 from level A.

1 from level E.

3 unassigned.

Type 7:

No. of specimens: 4.

Form: "Nosed" or "beaked" appearance due to projection at one end of long axis in 3 specimens, at the side in one specimen; ventral surface flat or concave; dorsal surface convex.

Technique: Steep retouch around projecting "nose", making a pointed scraper; 2 specimens also with one side flaked by flat retouch to make a cutting tool.

Size range: Length 2.3-4.5 cm., width 1.0-3.5 cm., thickness 0.6-1.1 cm.

Material: 4 chert.

Provenience: 1 from level B.
2 from level D.
1 from level G.

Type 8:

No. of specimens: 20.

Form: Large, thick, tabular flakes; frequently with cortex remaining; square to rectangular in outline usually, some irregular; cross-section usually trapezoidal, but some triangular or rounded dorsally; ventral surface concave (9 specimens), straight (4 specimens), convex (7 specimens).

Technique: Steep retouch on 2 edges usually (1 specimen with all 4 edges retouched); dorsal surface flaked to flatten (similar to type 4 in form, if not in size); 2 specimens have concave scraping edge, remainder are straight.

Size range: Length 3.9-8.1 cm., width 2.0-6.9 cm., thickness 1.1-3.2 cm.

Material: 15 quartzite, 2 quartz, 1 chert, 1 mudrock, 1 petrified wood.

Provenience: 1 from level A.
1 from level B.

6 from level D.

2 from level E.

3 from level F.

2 from level G.

5 unassigned.

Type 9:

No. of specimens: 13.

Form: Irregular flakes.

Technique: Limited steep retouch at one leading edge.

Size range: Length 1.4-4.2 cm., width 1.1-2.9 cm., thickness 0.6-1.4 cm.

Material: 5 chert, 4 chalcedony, 1 quartzite, 1 quartz, 1 petrified wood, 1 mudrock.

Provenience: 1 from level A.

2 from level B.

4 from level D.

1 from level F.

4 unassigned.

Scraper-Spokeshaves: (Fig. 13-g, h, l)

No. of specimens: 9.

Form: 2 of scraper type 2, with one lateral edge notched and worn;

3 of scraper type 4, with one lateral edge notched and worn;

2 of scraper type 5, with one lateral edge chipped

and worn;

1 plano-convex flake with worn notches on two sides;

1 long stemmed flake with scraper edge along both long axes and spokeshave notch at distal end.

Technique: Most notches are flaked and subsequently worn; flaking in notch ranges from flat to steep.

Size range: Length 1.4-4.8 cm., width 1.2-3.5 cm., thickness 0.4-1.0 cm.

Material: 3 chert, 2 mudrock, 1 quartzite, 1 obsidian, 1 chalcedony, 1 unidentified.

Provenience: 2 from level B.

2 from level C.

2 from level D.

2 from level E.

1 unassigned.

Spokeshaves: (Fig. 13-i, k)

No. of specimens: 14.

Form: All are irregular scrap flakes, except one (Fig. 13-i) which may have originally been a side-notched projectile point.

Technique: Steep to flat retouch and wear, making notches 0.3 to 1.4 cm. in diameter.

Size range: Length 1.8-9.6 cm., width 1.0-6.5 cm., thickness 0.2-1.5 cm. (large dimensions due to a single large cortex flake).

Material: 7 quartzite, 3 mudrock, 1 chert, 1 quartz, 1 chalcedony, 1 obsidian.

Provenience: 3 from level A.
2 from level B.
3 from level C.
3 from level D.
2 from level G.
1 unassigned.

Drills or Awls: (Fig. 15-j, k, l)

No. of specimens: 4.

Form: Elongated tools tapering to a flattened rounded point; two-edged lenticular cross-section; three specimens either with proximal ends snapped off or unworked, the fourth with a flattened expanded base, and basal notch for hafting.

Technique: Bifacially flaked, making a slim two-edged tool, with worn rounded end.

Size range: Length 2.3-5.8 cm., width 0.9-1.9 cm., thickness 0.5-0.7 cm.

Material: 1 quartzite, 1 chert, 1 mudrock, 1 chalcedony.

Provenience: 1 from level B.
2 from level D.
1 from level F.

Bifaces: (Fig. 14-a, b, c)

No. of specimens: 14.

Form: Flake (11 specimens) and core (3 specimens) tools bifacially flaked to produce a cutting edge continuous, or nearly so, around the circumference; flat lenticular to thick lenticular in cross-section; ovoid or elongated ovoid in outline.

Technique: Broad shallow flaking over both faces; the more "knife"-like tools have some retouch at the edge.

Size range: Length 3.2-12.4 cm., width 2.9-7.1 cm., thickness 0.8-3.6 cm.

Material: 10 quartzite, 2 mudrock, 1 petrified wood, 1 gneiss.

Provenience: 1 from level B.
2 from level C.
5 from level D.
2 from level E.
1 from level F.
3 unassigned.

Biface Fragments:

No. of specimens: 43.

Form: Either fragments of bifaces or large broken flakes, with bifacial flaking to produce an edge on one or more sides.

Technique: As bifaces above.

Size range: Length 1.8-10.2 cm., width 0.8-5.7 cm.,

thickness 0.4-2.1 cm.

Material: 30 quartzite, 4 chert, 3 mudrock, 3 quartz, 1 Knife River "flint", 2 unidentified.

Provenience: 4 from level A.
7 from level B.
6 from level C.
8 from level D.
4 from level E.
4 from level F.
4 from level G.
6 unassigned.

Pointed Bifaces:

No. of specimens: 10.

Form: As bifaces above but pointed at one end; no evidence of hafting.

Technique: As bifaces above.

Size range: Length 1.1-4.6 cm., width 1.7-3.5 cm., thickness 0.3-1.4 cm.

Material: 5 quartzite, 2 chert, 2 quartz, 1 clay-ironstone.

Provenience: 1 from level A.
1 from level B.
1 from level D.
4 from level E.
1 from level F.
1 from level G.

1 unassigned.

Unifaces: (Fig. 14-d, e, f).

No. of specimens: 11.

Form: As bifaces above.

Technique: As bifaces above but with flaking over one side only.

Size range: Length 3.2-9.3 cm., width 1.9-6.7 cm., thickness 0.9-1.4 cm.

Material: 5 quartzite, 5 mudrock, 1 quartz.

Provenience: 1 from level B.
2 from level C.
3 from level D.
2 from level E.
3 unassigned.

Uniface Fragments:

No. of specimens: 25.

Form: Either fragments of unifaces or large broken flakes with unifacial flaking covering one face, and with an edge on one or more sides.

Technique: As unifaces above.

Size range: Length 1.7-9.2 cm., width 1.5-6.9 cm., thickness 0.4-2.3 cm.

Material: 17 quartzite, 3 mudrock, 2 quartz, 1 chert, 1 chalcedony, 1 clay ironstone.

Provenience: 1 from level A.

3 from level B.

7 from level C.

6 from level D.

3 from level E.

1 from level F.

1 from level G.

3 unassigned.

Simple Flake Tools:

Type 1:

No. of specimens: 32.

Form: Irregular scrap flakes with flat flaking along both sides of an edge to produce a cutting tool.

Technique: Flat broad shallow flaking.

Size range: Length 1.5-5.9 cm., width 0.7-4.2 cm., thickness 0.3-1.8 cm.

Material: 10 mudrock, 8 quartzite, 8 chert, 3 petrified wood, 1 chalcedony, 1 chert-chalcedony, 1 unidentified.

Provenience: 5 from level A.

3 from level B.

3 from level C.

7 from level D.

2 from level E.

4 from level F.

8 unassigned.

Type 2:

No. of specimens: 99.

Form: As Type 1.

Technique: As Type 1, but with edge flaking on one side only.

Size range: Length 1.5-8.7 cm., width 1.2-8.4 cm., thickness 0.3-2.0 cm.

Material: 33 quartzite, 27 mudrock, 23 chert, 7 chalcedony, 3 chert-chalcedony, 2 petrified wood, 2 quartz, 1 jasper, 1 obsidian.

Provenience: 6 from level A.
18 from level B.
17 from level C.
14 from level D.
10 from level E.
12 from level F.
10 from level G.
12 unassigned.

Type 3:

No. of specimens: 93.

Form: Irregular scrap flakes.

Technique: Irregular broad shallow flaking over one side of a scrap flake.

Size range: Length 1.0-3.9 cm., width 0.3-2.8 cm., thickness 0.1-1.0 cm.

Material: 25 chalcedony, 23 obsidian, 12 quartzite, 12 chert, 7 mudrock, 4 chert-chalcedony, 3 Knife River "flint", 3 petrified wood, 2 clay ironstone, 1 jasper, 1 unidentified.

Provenience: 11 from level A.

19 from level B.

8 from level C.

14 from level D.

10 from level E.

9 from level F.

8 from level G.

14 unassigned.

Type 4:

No. of specimens: 190.

Form: Irregular scrap flakes.

Technique: Minor retouch or wear grinding, usually confined to a small area.

Size range: Length 0.9-10.2 cm., width 0.3-5.0 cm., thickness 0.1-1.6 cm.

Material: 43 mudrock, 41 quartzite, 41 chert, 20 chalcedony, 13 obsidian, 10 petrified wood, 5 quartz, 5 chert-chalcedony, 5 clay ironstone, 7 unidentified.

Provenience: 32 from level A.

16 from level B.

23 from level C.

23 from level D.

30 from level E.

25 from level F.

20 from level G.

21 unassigned.

Type 5:

No. of specimens: 57.

Form: Irregular scrap flakes.

Technique: One or more of the shorter edges or projections with polish from use.

Size range: Length 1.5-7.7 cm., width 0.7-4.9 cm., thickness 0.3-2.2 cm.

Material: 35 quartzite, 7 mudrock, 6 petrified wood, 3 quartz, 3 sandstone, 1 chert, 1 chalcedony.

Provenience: 11 from level A.
9 from level B.
7 from level C.
12 from level D.
5 from level E.
5 from level F.
2 from level G.
6 unassigned.

Microblades: (Fig. 15-a to f)

No. of specimens: 6.

Form: Parallel-sided blades; 2 triangular in cross-section, 4 trapezoidal in cross-section.

Technique: Analysis was performed on 4 specimens by David Sanger (Sanger 1968). His work is repeated here. "Primary ridge flake": 1 specimen; triangular cross-section; transverse flaking over both dorsal surfaces and originating from the crushed and

ground dorsal ridge.

"Secondary ridge flake": 3 specimens (a flake removed from the core at a location slightly to one side of the point where the primary ridge flake was struck off); a wide thin spall, lacking the high median dorsal ridge of the primary ridge flake, but with transverse flaking scars present. These specimens, termed "Form B" by Sanger, are triangular or trapezoidal in cross-section and have transverse flaking over at least one dorsal surface. ("Form A", of which there are no specimens in the Fullerton collection, are essentially plano-convex in cross-section, with transverse flaking covering the dorsal surface or with one ridge flake scar present from a previous detachment.)

"True Microblades": These are removed from the core after all the ridge flakes have been removed. As a consequence there are no transverse flaking scars present. The blades are trapezoidal in cross-section.

Note: Sanger's paper on the High River Microblade Industry lucidly describes a process of core preparation and blade manufacture based on his analysis of material from southern Alberta. He inspected 4 of the Fullerton specimens and noted

an essentially similar technology. Although the High River and Fullerton collections contained no cores, he was able to determine much of their nature. They were apparently cylindrical or tabular in shape, with little or no taper from platform to keel. Angles between the striking platform and the main axis averaged 83 degrees. There was apparently crushing, battering, and limited grinding at the dorsal edge of the striking platform prior to flake detachment.

Size range: Length 1.7-2.7 cm., width 0.7-1.1 cm., thickness 0.3-0.4 cm.

Material: 6 obsidian (grey-black, translucent).

Provenience: 1 from level B.
1 from level C.
1 from level F.
3 from level G.

Cores: (Fig. 15-g, h, i)

No. of specimens: 20.

Form: Large flakes, split pebbles, and "blocky" pieces of rock with no sign of preparation to any preconceived form.

Technique: Flakes detached from any likely-looking plane of the rock surface.

Size range: Length 1.8-5.1 cm., width 0.9-2.7 cm., thickness 0.6-1.6 cm.

Material: 11 chert, 4 quartzite, 4 chalcedony, 1 mudrock.

Provenience: 2 from level A.

3 from level B.

3 from level C.

2 from level D.

2 from level E.

1 from level F.

2 from level G.

5 unassigned.

Hammerstones:

No. of specimens: 2.

Form: Elongated flattened-ovoid small cobbles.

Technique: Both specimens exhibit battering marks just off the lateral edge near one end, and one also has battering just off the lateral edge closer to the middle of the rock.

Size range: Length 7.9-8.3 cm., width 4.1-5.9 cm., thickness 3.2-3.9 cm.

Material: 2 quartzite.

Provenience: 2 from level B.

Split Pebble Tools:

No. of specimens: 20.

Form: Small to medium size oval pebbles, split and then chipped to form a chisel-like edge at one or both ends; 6 specimens also retouched along one long axis to produce

a cutting edge; 6 specimens with retouched edge more or less continuous around whole perimeter.

Technique: Pebbles split by anvil and hammerstone method; 2 specimens are bipolar, 8 are unipolar, 10 have been subsequently modified to the extent that polar evidence is removed; "chisel" and "knife" edges created by either limited bifacial retouch at the edge (5 specimens), or unifacial retouch at the edge (5 specimens), remainder utilized without evidence of retouch.

Size range: Length 1.4-4.9 cm., width 1.2-3.6 cm., thickness 0.4-1.6 cm.

Material: 20 chert.

Provenience: 3 from level A.
3 from level B.
5 from level C.
1 from level D.
4 from level E.
2 from level G.
2 unassigned.

Comparable types: Pieces esquillées at the Debert site (MacDonald 1968). The Fullerton specimens are smaller, due to the size of local chert pebbles. Only one or two flakes were removed, from the ventral surface, to resharpen the original edge obtained by the

splitting.

<u>Special Tools</u>:

Type 1: Small Trapezoidal Bifaces.

No. of specimens: 3.

Form: These may have been elongate-triangular in form originally, but the extended portion has been snapped off; wide and flat cross-section with edge continuous on three sides.

Technique: Bifacially flaked with flat retouch at the edges of the three sides to produce knife-like edge; one specimen with steep retouch on one side to produce scraper-like edge.

Size range: Length 1.6-2.3 cm., width 2.2-3.1 cm., thickness 0.3-0.6 cm.

Material: 2 chert, 1 quartzite.

Provenience: 1 from level C.
1 from level D.
1 from level E.

Type 2: Hafted Knives (Fig. 13-j).

No. of specimens: 2.

Form: One specimen is side and basally-notched; the other has a single side notch.

Technique: Single-notched specimen made on a thin flake with edge retouch on both sides at edge; the other specimen bifacially flaked with retouch on both sides at edge.

Size range: Length 3.9-5.3 cm., width 1.9-3.1 cm., thickness 0.4-0.7 cm.

Material: 1 mudrock, 1 quartzite.

Provenience: 1 from level D.
1 from level F.

Type 3: Prismatic Flake Scraper.

No. of specimens: 1.

Form: A long, curved, prismatic flake.

Technique: Steep retouch along both sides.

Size: Length 2.7 cm., width 1.8 cm., thickness 1.1 cm.

Material: Chalcedony.

Provenience: Level G.

Type 4: Chisel-like Tool.

No. of specimens: 1.

Form: Sub-triangular in outline, and triangular in cross-section; curved flake.

Technique: One end bifacially flaked to produce a "chisel"-like edge; polish at this edge and on both sides, back of the edge.

Size: Length 3.8 cm., width 1.8 cm., thickness 1.1 cm.

Material: Chalcedony.

Provenience: Unassigned.

Type 5: Perforator (Fig. 13-f).

No. of specimens: 1.

Form: Irregular flat flake.

Technique: A sharp projection shows wear around one flat side towards the point.

Size: Length 2.4 cm., width 1.8 cm., thickness 0.4 cm.

Material: Mudrock.

Provenience: Level F.

Type 6: Perforator and Cutting Tool.

No. of specimens: 1.

Form: Flake with long rectangular outline and trianguloid cross-section.

Technique: Steep retouch at one end to produce a sharp projection; projection also shows polish from wear; one long axis with fairly steep retouch on one side, to make a cutting-scraping edge.

Size: Length 2.3 cm., width 0.8 cm., thickness 0.5 cm.

Material: Agate.

Provenience: Level G.

Type 7: Small Pointed Biface.

No. of specimens: 1.

Form: Elongated ovoid flake; triangular cross-section; one end pointed.

Technique: Bifacial flaking; continuous retouch around edge, except at one end.

Size: Length 2.1 cm., width 1.0 cm., thickness 0.3 cm.

Material: Chalcedony.

Provenience: Level E.

Type 8: Core Knife.

No. of Specimens: 1.

Form: Elongate tabular flake.

Technique: Flakes removed from both ends, and at right angles to the long axis on one side; subsequently the core was unifacially flaked with broad shallow flakes along one edge and then retouched to make a cutting edge.

Size: Length 2.9 cm., width 1.7 cm., thickness 0.9 cm.

Material: Quartzite.

Provenience: Level G.

Chopping Tools:

No. of specimens: 12.

Form: Large broken cobbles, or large flakes from cobbles; irregular outline and cross-section.

Technique: One edge of the broken cobble or flake slightly chipped to produce a crude chopping edge.

Size range: Length 6.2-21.0 cm., width 4.4-18.0 cm., thickness 2.4-5.0 cm.

Material: 9 quartzite, 1 granite, 1 gneiss, 1 sandstone.

Provenience: 3 from level A.
2 from level B.
3 from level D.
2 from level E.
1 from level G.

1 unassigned.

<u>Ochre</u>:

No. of specimens: 16.

Form: Irregular small lumps.

Technique: Not definable.

Size range: 0.2-2.2 cm. square.

Material: iron oxide.

Provenience: 1 from level A.

2 from level C.

8 from level D.

3 from level E.

2 unassigned.

<u>Questionable Tools</u>:

No. of specimens: 20.

Form: Irregular flakes and flaked cobbles.

Technique: Broad shallow flakes rather randomly placed; no sign of wear, but this lack may be due to obliteration by firing and/or weathering; possibly used as cutting and chopping tools.

Size range: Length 1.7-15.4 cm., width 1.0-8.1 cm., thickness 0.4-4.8 cm.

Material: 13 quartzite, 3 sandstone, 2 petrified wood, 1 chert, 1 quartz.

Provenience: 4 from level B.

5 from level C.

4 from level D.

1 from level E.

3 from level F.

2 from level G.

1 unassigned.

Tubular Pipe: (Fig. 16-f, g, h)

No. of specimens: 3 fragments from same pipe.

Form: A tubular pipe of uncertain length.

Technique: Inside wall shows vertical manufacturing striations; outside surface probably rubbed or ground to smoothen; inside diameter 2.5 cm., outside diameter 3.7 cm.

Size range: Length 2.4-3.4 cm., width 2.3-2.7 cm., thickness 0.5-0.7 cm.

Material: Porous grey sandstone.

Provenience: 2 fragments from level D.

1 unassigned.

# CHAPTER FOUR

## POTTERY

A total of 24 body sherds were recovered from the eastern pits at the Fullerton site. Level A contained 16 sherds, level B contained 3, and 5 were surface collected or of uncertain provenience. There were 4 discernible types (or 4 vessels) represented among those pieces large and distinctive enough to allow tentative classification.

Type 1: Sand-tempered, stick incised (Fig. 16-c).

No. of specimens: 1.

Provenience: Unassigned.

Construction: Molded?

Color: Grey-buff exterior, grey interior.

Hardness: 2.5-3.0 (Mohs scale).

Paste: Sandy clay.

Temper: Abundant small (less than 0.2 cm.) pieces of felspar.

Surface finish: Uncertain.

Decoration: Incised with short shallow strokes of a stick.

Thickness: 0.9-1.1 cm.

Comparable types: Mortlach Check-stamped _ca_. A. D. 1780 (Wettlaufer 1955: 20-21) by most characteristics except decoration.

Fall River Type 5 _ca_. A. D. 1,500-1,600 (Wettlaufer and Mayer-Oakes, _et_. _al_.: 28) by most characteristics except hardness and interior finish.

Type 2: Undecorated, buff-exterior.

No. of specimens: 3.

Provenience: 2 from level A.
1 unassigned.

Construction: Molded?

Color: Buff exterior, light grey to buff interior.

Hardness: 3.0.

Paste: Clay.

Temper: Crushed granite (quartz, felspar), 0.2-0.6 cm.

Surface finish: Smoothed by scraping tool.

Decoration: Nil.

Thickness: 0.7-1.0 cm.

Comparable types: Moose Jaw Cord-marked ca. A. D. 1780 (Wettlaufer 1955: 26-27) by some characteristics except hardness, decoration, and thickness.

Smoothed-surface pottery of various types is common in Alberta surface collections.

Type 3: Punctate-decorated, brown ware (Fig. 16-a, b).

No. of specimens: 10.

Provenience: 8 from level A.
1 from level B.
1 unassigned.

Construction: Patch or layered.

Color: Dark brown exterior, grey-brown interior, grey-black core.

Hardness: 3.0.

Paste: Clay.

Temper: Crushed granite (quartz, felspar), 0.1-0.4 cm.

Surface finish: Smoothed or wiped while wet.

Decoration: Random punctations made by a dull pointed instrument 0.1 cm. wide, to a depth of 0.1 cm., some slight dragging of tool occasionally.

Thickness: 0.6-0.8 cm.

Comparable types: Unknown.

Type 4: Irregular gouged holes.

No. of specimens: 5.

Provenience: 3 from level A.
2 from level B.

Construction: Patch?

Color: Buff exterior, grey-black interior.

Hardness: 2.5-3.0.

Paste: Silty clay.

Temper: Crushed granite (quartz and felspar), 0.05-0.3 cm.

Surface finish: Scraped smooth by some tool (interior and exterior).

Decoration: Irregular holes (0.4 cm. diameter by 0.2 cm. deep), gouged out or struck by some unknown blunt tool (grooved paddle?).

Thickness: 0.4-0.5 cm.

Comparable types: Unknown.

Discussion of Pottery:

The size of the sample is small, as are the individual pieces. Such diagnostic items as rims and bases are missing. Pottery is not common in central Alberta, but somewhat larger amounts are found in the extreme south of the province. Interestingly, the Peace Hills material discussed here, and later in this report, contained no specimens with discernible cord-markings.

Pottery in Alberta is considered by most workers to be of recent age. However, the association of pottery with Besant points at the Felt site (Kehoe 1964) in southern Saskatchewan, with an associated radiocarbon date of A. D. 354$\pm$70 years, suggests that pottery was also used somewhat earlier. Fullerton types 1 and 2 are similar, but not identical, to types estimated to date from A. D. 1500 to the Historic period from the Mortlach and Long Creek sites. Thus the associations mentioned here are of necessity limited and tenuous.

Wettlaufer (Wettlaufer and Mayer-Oakes, *et*. *al*. 1960: 105-107) suggests that the Gros Ventre Indians (probably the Algonkin Gros Ventre, rather than the Hidatsa Gros Ventre that he mentioned), who were in the area at this time, were responsible for the pottery. At the present time it is impossible to assign definitely any tribal group to the Fullerton pottery, though the Algonkin Blackfoot seem the most likely candidates.

# CHAPTER FIVE

## BONE TOOLS

Bone tools numbered only 14, and were difficult to identify. The bone material was frequently somewhat friable; and many pieces exhibited evidence of gnawing by animals, principally rodents. Very few showed any signs of sand abrasion, however, a fact indicating that wind action was not too intensive on the dune top once some vegetation had become established. The tools were identified largely by evidence of usage, rather than by any indications of preparation. By all appearances, a likely bone fragment would be given minimal preparation (if any), used perhaps for but a single occasion, and then discarded.

### Scrapers:

No. of specimens: 4.

Form: Triangular to trapezoidal in outline; trapezoidal or rectangular in cross-section.

Technique: Fragments of bone selected seem to be from the hard long bone shafts; some show minor flaking at the edge but most show only wear, which may have removed any cutting or flaking marks.

Size range: Length 1.4-3.9 cm., width 0.7-1.6 cm., thickness 0.2-0.6 cm.

Material: Probably from long bone shafts of bison.

Provenience: 1 from level C.
2 from level G.
1 unassigned.

Flaking tools? (Fig. 17-a).

No. of specimens: 2.

Form: A slim pencil-like piece of bone, rounded at one end; and a rib section sharpened to a point.

Technique: Ends of both specimens show signs of wear; possibly used as a flaker or punch for detaching rock flakes.

Size range: Length 3.9-15.2 cm., width 1.0-3.0 cm., thickness 0.5-1.6 cm.

Material: 1 rib section, and the other specimen unknown.

Provenience: 1 from level A.
1 from level B.

"Pot-scraper"? (Fig. 17-d).

No. of specimens: 1.

Form: A bison ulna with the distal extension notched or grooved several times.

Technique: As the notched area was somewhat friable it is difficult to say how the notching was accomplished, or how usage had modified it. There is the possibility that the "notching" was accomplished by the gnawing of animals though the large and regular size would suggest that this was not the case.

Size range: Length 16.5 cm., width 8.7 cm., thickness 2.8 cm.

Material: Bison ulna.

Provenience: Level B.

Drill:

No. of specimens: 1.

Form: Small piece of tooth.

Technique: No signs of preparation, but there is extensive polish around a pointed projection.

Size range: Length 1.5 cm., width 0.8 cm., thickness 0.3 cm.

Material: Bison molar fragment.

Provenience: Level G.

"Chisel" or Small Knife:

No. of specimens: 1.

Form: A small rectangular piece of bone; with rectangular cross-section.

Technique: One edge with chipping on both sides to make a knife-like edge; some evidence of usage by the polish.

Size range: Length 4.3 cm., width 1.4 cm., thickness 0.5 cm.

Material: Probably a fragment of long bone; species unknown.

Provenience: Level A.

Rubbing or Abrading Tools: (Fig. 17-b, c).

No. of specimens: 3.

Form: 3 long bone sections; irregular outline; curved rectangular cross-section.

Technique: No signs of preparation; rubbing or abrading a soft material (hide?) produced a smoothly worn

end.

Size range: Length 5.2-21.3 cm., width 3.1-4.5 cm., thickness 0.7-1.0 cm.

Material: Fragments of long bone shaft (one from upper end of bison tibia shaft).

Provenience: 1 from level A.
1 from level B.
1 unassigned.

Discussion:

A bone industry seems to have been little developed in the Peace Hills area. This situation is common for Plains archaeological sites, as compared to the Woodlands. Again, this fact emphasizes the essentially Plains-oriented nature of the site. The apparent concentration of bone tools in levels A, B, and G may or may not be a cultural reality. At the time of excavation, the bone from the middle levels was noted to be in the poorest state of preservation, a situation making tool identification extremely difficult.

# CHAPTER SIX

## A HEARTH

Pit B contained a hearth with 35 large pebbles and cobbles of fire-cracked rocks, ranging from 3.0 to 15.0 centimeters in diameter. The rocks were scattered rather randomly over a 70 centimeter square area. Within the area covered by the rock, and immediately below, were small (1 centimeter square) pieces of charcoal and charcoal ash, mixed with the sand, to a depth of about 5 centimeters. Beneath this charcoal and sand layer was a mass of fragmented and burned bone. The upper part of the bone layer consisted of scattered bone fragments mixed with some charcoal. However, as the depth increased the bone area decreased. The bone mass, extending downwards 20 centimeters in an ever-narrowing cone shape, became highly compacted. The bone was greatly fragmented, having been almost completely pulverized. Within this compact mass of burned bone were two pieces of unfired and unfragmented bone: an ulnar carpal, and a basal portion of neural spine (both probably representing bison).

Apparently a hole had been scooped out in the sand and a mass of pulverized burned bone (with the two fresh pieces) had been dumped into the hole. Small branches and rocks for a fire were then placed over this mass.

About 50 centimeters to the east of this hearth was a small pile of cobble-sized rocks at about the same depth. There was no bone or charcoal associated with this pile. The two features may or may not be associated.

The only artifact possibly associated with the hearth was the distal end of a projectile point. This was found below the surface of the bone layer, but about 10 centimeters distance from the narrowing bone basin.

Assuming that the surface level of the hearth was at the base of the rocks, the feature would be in level C (ca. 2-3,000 years B. P.). If, however, the rocks themselves were in a basin, over 10 centimeters deep, then the feature would be in level B (ca. 1-2,000 years B. P.).

A sample of burned bone was submitted to the Geological Survey of Canada and a date of 1,230 $\pm$ 130 years B. P. (G.S.C. 641, N.M.C. 98) was obtained, indicating a level B association. The sample, however, was likely contaminated due to the presence of many rootlets, and the ready access to present-day rainwater percolating down from the surface. If the second pile of rocks was associated and placed on the ground surface, then the hearth would appear to be in level C, indicating that the sample was indeed contaminated.

The interesting feature of this hearth was the smashed and highly compact mass of burned bone. Perhaps this construction gives a hotter fire, with longer lasting heat. The hearth appears to be a little early to be used for firing pottery, and the only safe conclusion is that someone about 1-3,000 years B. P. took some extra trouble in cooking his food.

# CHAPTER SEVEN

# FAUNAL AND FLORAL REMAINS

## Faunal Remains

The Fullerton site contained 387 recoverable bones, most of which were in broken or fragmented condition. During excavation the bone was found to be rather soft and friable due to its tendency to attract moisture and roots, and also because of the acid condition of the soil. Generally speaking the bone at the lowest levels was somewhat harder than that of the middle levels, a condition due, apparently, to an assimilation of iron oxides. The bone in the uppermost levels was also better preserved, being more recently deposited.

Appendix F gives a summary of the 338 bones that could be identified as to species and assigned to a level. Bison is the predominate animal present at all levels (58.6 per cent of total), and it is likely that most or all of the bone in column three (large ungulate 37.9 per cent) is also bison. The total number of bones is small, but it is evident that bison hunting was the way of life throughout the time period represented at the site.

Most of the bison bone falls within the size range for *Bison bison bison*, the Plains variety. However, ethnographic data has shown that the female of the species was the most desirable kill, the hide being more manageable and the meat more palatable; and this fact may have considerable bearing on the size of the bones. Woods bison (*Bison bison athabascae*), a larger and more solitary animal, also inhabited the area or immediate vicinity in the past (see Skinner and Kaisen 1947);

and there is the possibility that some of the larger bones represent this variety.

*Bison occidentalis* became extinct, along with various other genera and species, between 12,000 and 8,000 years B. P. (Newell 1963). Fuller and Bayrock (1965: 57) are of the opinion that "*Bison occidentalis* graded slowly but continuously into *Bison bison athabascae* and hence in a sense, did survive." This event seemingly happened on the Northern Plains; while, farther south, *Bison bison bison*, the smaller Plains animal, was also evolving from some larger animal. Interbreeding undoubtedly took place in areas of contact between the two modern sub-species. Some Plains archaeological sites, such as the Long Creek site in southern Saskatchewan (Wettlaufer and Mayer-Oakes, *et. al*. 1960) and the Powers-Yonkee bison trap (Bentzen 1962), contained bison skulls with many measurements larger than the modern species. Associated radiocarbon dates were $293 \pm 100$ years B. C. at the former site, and *ca*. $2,500 \pm 125$ years B. C. at the latter site.

The Fullerton site, coming into cultural existence over 6,000 years B. P., could conceivably contain specimens of both the extinct and the two living varieties of North American bison. However, only five bones (one metacarpal each in levels B, C, G; a metatarsal in level F; a first phalanx in level C) seem larger than usual. Their distribution through four levels, however, suggests only that they represent large males of modern species size.

Moose (*Alces alces*), represented by one scapula and one distal portion of a right tibia, presently frequents the marshy grounds and

willow thickets of the Parkland, Boreal, and Cordilleran forest areas. Moose bones occurred in level D (*ca*. 3-4,000 years B. P.) and level A (0-1,000 years B. P.). The level D provenience bears out the previously discussed evidence for an increased forestation, at the expense of grassland, during this time.

Elk (*Cervus canadensis*), represented at the Fullerton site by a single right acetabulum portion, is not as safe an environment indicator. Early historical accounts record their presence in the Parklands area, usually close to forested river valleys. In all probability they followed these treed valleys for at least short distances into the Plains area. They have only recently been restricted to the foothills, mountains, and certain government parks in the Parklands. This situation is much the same for mule deer (*Odocoileus hemionus*), of which a single specimen of bone, a metacarpal or metatarsal in level B, was found at the Fullerton site. Thus these two animals suggest only that the area had some forest cover for the time periods represented.

The canid bones (one proximal portion of a humerus in level G; one acetabulum and one scapula in level B) represent fairly large animals; *i.e.*, larger than a coyote. The species could not be determined; thus the bones are representative of wolf and/or large dog, neither of which are habitat indicators.

Five specimens of beaver (*Castor canadensis*) bone were found: one mandibular molar in level E; one humerus in level D; one proximal portion of a femur and one proximal humerus epiphysis in level B; one

mandible portion and 3 mandibular teeth in level A. In recent times beaver have inhabited the waterways of almost the entire continent north of the Rio Grande River. Thus the Fullerton specimens contribute no information concerning the local environment. There may, however, be some cultural significance to their first occurrence in level E (ca. 4-5,000 years B. P.). Beaver remains are usually found in those archaeological sites of the forested areas. Their presence in nearly all levels from level E to level A helps support the other evidence for expanding forestation.

Thus the faunal remains, though limited in number and in species represented, confirm the other evidence for the start of an environmental change, about 4,000 years ago, towards the Parkland condition that prevails today in the area.

Appendix G lists the 179 specimens of bones of the larger animals (bison, large unidentified ungulate, moose, elk, and deer) that could be identified and assigned levels. These are the more important indicators of butchering practices (White 1953). All of the larger bones were broken during the butchering process and/or later for the marrow content. Many showed evidence of rodent and perhaps canid gnawing activities; but, as mentioned previously, surprisingly few showed any signs of erosion by sand.

The minimum number of bison represented in the excavated part of the site was 21, as indicated by the number of acetabula. This bone was fairly well distributed throughout all levels; hence this number was not divided by two, it being unlikely that any two

were from a single animal.

The skull proper was represented by one portion of a bison horn core. Being porous it had disintegrated easily. Only 4 ossicles and 9 maxillary teeth were found. As borne out by ethnographic data, the skull was not considered by hunters as an item to be dragged home from the kill site. Thus the edible part, the brains, would be removed during the butchering process.

Mandibles were represented by 12 specimens (bison), all of which were little more than fragments of bone spanning and including 2 or 3 molars and premolars. Evidently the practice of bringing the tongue with mandible attached back to the camp was common. However, the articular portion and the distal portion of the mandible was apparently left at the kill site, presumably to lighten the hunter's load.

Vertebrae, numbering 9 specimens, were in such fragmented condition that species and type identification was impossible, though all appeared to represent large ungulates. Wilson (1924: 201) states that this part of the skeleton, if brought back from the kill site at all, ended up as dog food. Apparently this was the case at the Fullerton site.

The scapulae recovered (10 specimens) consisted only of the articular end and a short portion of the neck. Either the remainder was left at the kill site (the meat is easily stripped off), or it was cut up for tools at the camp site. However, no such tools were recovered.

Humerus bones recovered (13 specimens) were all distal portions. White (op. cit.: 162) explains this discrepancy in sites as possibly being due to the heavy usage of the proximal end as an abrader or pounding tool, so much so that it is largely destroyed.

The radius (6 distal and 4 proximal portions) and ulna (8 proximal portions) were not desirable items in that they carried little meat and marrow.

Metacarpals (8 proximal and 8 distal portions) were the most common forelimb element recovered. This is an unusual situation (see White 1954: 261) and may be due to the small total sample recovered, and/or to more extensive butchering.

White (Ibid: 256) points out that the hind limb could be removed by two methods: either the ilium was cut just back of the sacral attachment and the pelvis split at the symphysis, or the neck of the femur was cut through. Of the 21 acetabula recovered, only 3 (1 in level E, 2 in level D) were examples of the former method. This ratio bears out White's conclusions that the latter method was more popular.

Femora were represented by only 6 proximal portions. Three of these had been broken at the neck, 2 were epiphyses, 1 was broken in the main shaft. The absence of the distal ends is possibly due to their destruction to obtain marrow.

The tibia was represented by 2 proximal and 22 distal portions. This ratio agrees roughly with White's figures. He suggests that this imbalance of numbers may be due to the destruction of the proximal end

to obtain marrow, while the distal end served as a steadying hand-hold.

Metatarsals were represented by 4 proximal and 5 distal portions, a closer approximation to White's percentage figures than were the metacarpals.

The phalanges (14 firsts, 12 seconds, 1 third) were largely in unbroken condition though considerably gnawed by animals. Six first phalanges may have been broken open for bone grease, but subsequent damage destroyed the evidence. Probably the phalanges were also considered as dog food.

A general increase was noted in the number of bones from the lower levels to a peak in levels C and D, and then there was a decline in more recent times. The situation was closely paralleled by the number of artifacts. This distribution may be due to a faulty location of the level boundaries, but the provenience of the type projectile points seems to rule against such a possibility. With the increasing forestation and declining grass cover of this time, the distribution of bones would suggest that the area was becoming a Parkland and able, for a time, to support both the large herds of the grazing animals and the lower numbers of browsers. A more genial and diversified environment may have brought on a minor population expansion in the area. The subsequent gradual decline may have been due to overtaxation of the environment, though other more definite factors will be pointed out later in this report.

The following table gives the broad age categories, by level, for those bison and large ungulate bones that could be so classified.

| Level | Mature | Youth | Immature | Total No. | % |
|---|---|---|---|---|---|
| A | 4 | 2 | 1 | 7 | 6.4 |
| B | 15 | 0 | 4 | 19 | 17.3 |
| C | 24 | 2 | 1 | 27 | 24.5 |
| D | 25 | 7 | 1 | 33 | 30.0 |
| E | 10 | 4 | 0 | 14 | 12.7 |
| F | 3 | 1 | 0 | 4 | 3.6 |
| G | 4 | 2 | 0 | 6 | 5.5 |
| Total | 85 | 18 | 7 | 110 | |
| % | 77.2 | 16.4 | 6.4 | | 100.0 |

Age was determined by tooth wear and condition of epiphysis fusion. Tooth wear categories (as in Kehoe 1967--based on information from Skinner and Kaisen 1947: 143-46) were determined as follows:

Mature: molars well worn, premolars wearing.

Youth: little or no wear on molars present.

Immature: short deciduous molar teeth and undeveloped premolars.

The criteria for epiphysis fusion of the long bones were taken from I. W. Cornwall's "Bones for the Archaeologist" (page 229). Where the epiphysis was separated or absent, the individual was considered immature. When the line of union between the fused epiphysis and shaft was still visible, the individual was considered adolescent. When this line was no longer visible, the individual was considered an adult. Categories for tooth and epiphyseal condition approximate each other

by age: immaturity covers 0-1 year in age, youth 1-4 years in age, maturity 4 years and over. No attempt was made to sex the bones, due to the uncertainties in such identifications and the small size of the sample.

The table demonstrates a heavy reliance on the hunting of mature animals, a situation similar to that recorded for the Historic period in the Plains. Those specimens representing immature and youthful individuals possibly represent the kills accomplished by the youngsters of the band.

The only human skeletal material found was a well-worn mandibular first molar, with roots intact but with fragments of enamel missing. The occlusal surface was worn into the dentine, indicating that the individual's age may have been in excess of thirty years. Unfortunately the specimen was found at the surface in the ditch cut, and had evidently been redeposited in recent times.

Floral Remains

Living, and recently dead, grass and shrub rootlets were present throughout the cultural zone at the Fullerton site. They were particularly common in the upper levels. Some small, thin lenses of charcoal contained unidentifiable highly fragmented and burned pieces of plant material. These occurred only in the upper levels. In all likelihood, soil forming processes and percolating rainwater destroyed or dispersed any similar features that may have been present at lower levels.

The pits of red chokecherry (*Prunus virginiana*) were

occasionally found during excavation. As this plant grows in the area today, and because the pits were invariably in rodent caches, any inference of utilization by man in the past, or of existing floral patterns, was rendered inconclusive. There were only three instances where the pits may have been dropped on an old sod surface; that is, they did not appear to be in rodent holes. One pit was found in each of three levels, G, D and C. Red chokecherries are common in the wooded areas of the Parklands.

The same situation exists (small sample, small specimen, questionable provenience) for a single beaked hazelnut (Corylus cornuta). The specimen was intact except for the stem attachment portion, and it may have dropped to the ground surface from a bush upon reaching maturity. This specimen was found in level B. The hazelnut is found in the same wooded areas as the red chokecherry.

Thus the evidence is tentative but follows along with the picture presented by the other data: an environment with some forestation is indicated for levels D, C, and B. The chokecherry pit in level G may be representative of the earlier forestation (indicated by the pollen profiles), which seems to have existed before the grassland expansion.

# CHAPTER EIGHT

## OTHER PEACE HILLS SITES

Sites in the Peace Hills (see Fig. 3), other than the Fullerton site and site FfPi101 (which saw limited test excavation), are represented by surface collections only. In general, the sites were in locations that seemed not as desirable as the Fullerton site, being within the Hills area and on the lower and smaller dunes. The small amount of material recovered was found in plowed fields, cattle trails, and in some areas where the wind had shifted the topsoil slightly.

### Site FfPi101 (l.s.d. 4-27-46-24W4m.)

This site is located approximately 60 meters north of the Fullerton site, in a flat low-lying area. The land had been plowed in the past, and material was found at the surface. Three widely spaced pits were excavated. In all pits the plow zone extended down 20 centimeters, and one pit had an older plow zone to 30 centimeters depth. At 45-50 centimeters depth there was a transition from grey-black to grey sand. This boundary was indistinct, as it was at the Fullerton site. Again like the Fullerton site there was a change to culturally-sterile sand, with an indistinct boundary, at 90-100 centimeters depth. Unfortunately the plowing and exceptionally abundant rodent activity left the provenience of every artifact open to question.

Projectile points:

One base Fullerton type 3a, two Fullerton type 4d.

Scrapers:

Two Fullerton type 1, two Fullerton type 2, one Fullerton type 3, two Fullerton type 9.

Pointed Biface:

One specimen.

Simple flake tools:

Two Fullerton type 3, six Fullerton type 4, five Fullerton type 5.

Pottery:

Two unidentifiable fragments, one body sherd Fullerton type 2, one rim sherd Fullerton type 4. This latter specimen indicated that the interior of the vessel was straight to the rim edge; the exterior flared out slightly and then rounded to a flat rim top; there were three diagonal stick-incised lines to the right facing the interior and over the rim top.

Site FfPi102 (l.s.d. 3-27-46-24W4m.)

This site, about 1,300 meters east of the Fullerton site, was almost as good a vantage point as the latter site. The dune, which is linked with the Fullerton dune, is about 8 meters lower in elevation. The occupied area was limited to the southernmost part of the dune, and much of it had also been removed in road construction. This part of the dune was flat-topped, and covered about 13.5 ares (one-third of an acre). The rest of the dune, stretching north, was rather "hog-backed". Rock flakes and fragments of bone were fairly plentiful, and a few artifacts

were recovered.

Scrapers:

One Fullerton type 5.

Simple flake tools:

One Fullerton type 3, three Fullerton type 4, one Fullerton type 5.

Cores:

One flat core with broad flakes removed in random fashion.

Special tools:

One small broken flake with a deeply notched edge (for hafting?)

Pottery:

Two body sherds Fullerton type 1, one body sherd Wascana ware (to be discussed below).

Mr. Terry Dafoe had collected pottery for some time at this site, and he kindly loaned his collection for inspection. The types were as follows:

Type 1: Wascana ware (Fig. 16-d, e).

No. of specimens: 20 body sherds, 1 rim sherd.

Provenience: Surface collected.

Construction: Layer build-up.

Color: Brown exterior, grey-black interior.

Hardness: 3.0-3.5

Paste: Clay.

Temper: Crushed granite (quartz, felspar) 0.1-0.3 cm.

Surface finish: Puddled surface (interior and exterior), scraped smooth by some unknown instrument.

Decoration: Incised and scored over the body by means of some edged or pointed tool, in vertical or nearly vertical strokes up to 1.7 cm. long; no patterning evident; rim sherd undecorated.

Thickness: 0.6-1.1 cm.

Comparable types: Kehoe (1959) has defined this type of ware from samples obtained in southern Saskatchewan, where it appears to be associated with bison drives and small side-notched points of the late prehistoric and proto-historic period.

Type 2: Ethridge ware?

No. of specimens: 3 rim pieces without the uppermost portion.

Provenience: Surface collected.

Construction: Layer build-up?

Color: Grey interior and exterior.

Hardness: 3.0-3.5.

Paste: Silty sand.

Temper: Abundant crushed granite (quartz, felspar) 0.1-0.3 cm.

Surface finish: Interior and exterior scraped smooth by unknown instrument.

Decoration: Body unknown; vertical stick incising starting just below the flaring of the rim and carried upwards onto the rim edge (and perhaps over the rim top, but this portion is

missing in the sample).

Thickness: 0.5 cm. for the body end of the neck, and 0.9 cm. for the rim end of the neck.

Comparable types: Kehoe (1959) also defined Ethridge ware which, with Wascana ware, makes up the Pisamiks tradition (tentatively associated with the Plains Algonquian people of proto-historic times). Ethridge ware is found in south and central Alberta.

In addition there were 31 small pieces that were unidentifiable, and a body sherd of Fullerton type 2.

Site FfPi103 (l.s.d. 13-22-46-24W4m.)

A low southwesterly extension of the same dune complex containing the Fullerton site and site FfPi102 saw some limited human occupation. The dark grey sand sod had been recently stripped off and stockpiled, and the underlying yellow sand taken for road fill. An inspection of this stockpile yielded a few rock flakes and some artifacts.

Biface fragments:

Two specimens, one of which was pointed.

Simple flake tools:

Six specimens Fullerton type 4.

Core:

One small unprepared quartzite specimen.

Chopping tools:

Three large specimens.

Site FfPi104 (l.s.d.'s. 2, 7-32-46-24 W4m.)

This site is located along the east bank of Bigstone Creek, well within the Peace Hills area. A few rock flakes and large modified cobbles were found scattered along about one kilometer of the pasture land bordering the creek. The area is a good campsite; being within the shelter of dunes to the immediate south and east, and with water and wood nearby. Artifacts found were:

Flake tools:

One lamellar ridge-flake tool (Fullerton type 2).

Chopping tools:

Eleven large crude chopping tools.

Maul:

One full-grooved specimen, length 12.0 cm., width 9.5 cm., thickness 7.5 cm., blunted ends, "blocky" appearance.

Bead:

One blue clay "pony" trade bead, 0.5 cm. in diameter and 0.3 cm. thick.

Site FfPi105 (l.s.d.'s. 13, 14-21-46-24 W4m.)

Some waste flakes and bone fragments were found in low-lying plowed field. The material was well-scattered, and nothing was kept. Such areas possibly represent kill and butchering sites.

Site FfPi106 (l.s.d. 5-28-46-24 W4m.)

This site is located on a dune complex almost identical in form to that which contains the Fullerton site and sites FfPi102, and

FfPi103, but is 15 meters lower in elevation. Most of the area is well-plowed, and has been surface collected in the past. Artifacts found were:

Projectile points:

One specimen Fullerton type 2b (Duncan point).

Scrapers:

One Fullerton type 4, one Fullerton type 8.

Simple flake tools:

One Fullerton type 1, one Fullerton type 4.

Hammerstones:

One specimen: flat cobble with battering almost continuous around edge, and on one flat face; length 9.5 cm., width 9.0 cm., thickness 3.0 cm.

Chopping tools:

Seven crudely and slightly flaked cobbles.

Site FfPi107 (l. s. d. 7-33-46-24W4m.)

This site is located on a low longitudinal dune lying in a marshy area. Only two rock specimens were found but both were artifacts.

Simple flake tools:

One Fullerton type 4, one Fullerton type 5.

Site FgPi100 (l. s. d. 2-4-47-24W4m.)

This site is located in the northwestern-most extension of the Peace Hills, on a high flat overlooking Bigstone Creek. Some rock flakes and fragmented bone were found. The area had been surface collected for

many years, and was under cultivation. Most of the artifacts collected in the past had long since been lost or dispersed by movement of previous owners. A few artifacts, however, had been found by the present owner, Mr. Bradlow; and he kindly donated them to the University of Alberta.

Scrapers:

One Fullerton type 3.

Simple flake tools:

One Fullerton type 2.

Bifaces:

Two specimens, elongate-ovoid in shape.

Chopping tool:

One crudely and slightly flaked specimen.

## Local Artifact Collections

Many of the local inhabitants were aware that artifacts had been collected on their land, but these were in the possession of previous owners who had left the area. Only one person, Mr. Bradlow, had any of his own. However, the city of Wetaskiwin is very fortunate in having as a citizen Mr. Stan Reynolds. Over the years Mr. Reynolds has bought up the local collections for his Western Canadian Pioneer Museum, situated in Wetaskiwin. Mr. Reynolds, who took part in the Fullerton excavation, kindly allowed inspection and photographing of his collection. In numbers and types his collection is almost identical to the material recovered from the Fullerton site. However, there are no microblades, very little pottery, and only one possible trade item: a glass bead.

Certain items were photographed, and are presented here as Fig. 18. The projectile points, with two exceptions, mirrored those found at the Fullerton site. A large corner-notched point (Fig. 18j) may be comparable to Fullerton type 3a. This point was made of black opaque obsidian, and had basal thinning and grinding. The other exception (Fig. 18-m) was a leaf-shaped point with bifacial flaking to the center-line. Flaking was parallel and at a 90 degree angle to the main axis. There was some evidence of polishing over the two faces. This type of point is widely distributed over North and South America. MacNeish (1958b) has applied the name Lerma to them; and he suggests (Ibid: 1963) that one of the earliest northern traditions, the Cordilleran ca. 9-11,000 years B. P., is characterized by these points. The various Johnston collections from southern Alberta (see Wormington and Forbis 1965) frequently contain these points, all surface collected but consistently found with Cody Complex material, a fact which is suggestive of a somewhat later time period for the Alberta specimens.

Of considerable interest in the Reynolds collection is a cylindrical tool (Fig. 18-n) of soft porous limestone (tufa?), with the ends worn smoothly and at an angle to the main axis. This tool was probably used as an abrader, hide-grainer, or hide-colorer, rather than as a plant and seed grinder.

Other projectile points (Fig. 18-h, k, l) seem to be the same as Fullerton type 3a. The Hanna-Duncan-McKean series seems evident in Fig. 18-b, f, g (Fullerton types 1b and 2b). The Prairie Side-notched point is represented in Fig. 18-a, e, i (Fullerton type 4d). Figure 18-d

is a Plains Side-notch point (Fullerton type 4e), while Fig. 18-c is comparable to Fullerton type 5.

# CHAPTER NINE

# SUMMARY

## Foreword

Obviously the data presented here suffer from certain inherent weaknesses. Over 6,000 years of prehistory is confined within a vertically shallow area which has been subject to rodent and water activity. The eolian nature of the deposit implies at least some wind disturbance after initial deposition. The arbitrarily equal time-stratigraphic levels, that were designated, can only approximate reality. As for the pollen profiles, the assumptions were made that the peat bogs accumulated at a constant rate, and from a point 10,000 years B. P. in time. In addition, the expansion of grasses-composites-chenopods in the lower middle part of the profiles could mean one of two things: either the area became a grassland; or the area became only a grassier Parkland. A previous grass cover is indicated by the black soils zone, but such soils are not typical of the more arid Plains area to the south.

Nevertheless, the sequence of events postulated in this report presents a coherent picture. Though the data are limited and occasionally equivocal there are no outstanding contradictions, either within the Peace Hills data, or within that from other sites in the Northwest Plains.

The level summary to follow, which gives the impression of time-bounded reality, is actually a model designed to integrate and explain certain cultural and environmental data. The author hopes that this model will be an accurate, albeit limited, portrayal of certain aspects of the postglacial prehistory of central Alberta.

Summary by Levels

Level G: Circa 6-10,000 years B. P.

The present archaeological evidence for man in Alberta is limited to glacial time. The Laurentide and Cordilleran ice sheets of the Wisconsin glacial period began to waste away under "postglacial" climatic conditions about 14,000 years B. P., the retreating ice margin reaching southern Alberta by 12,000 years B. P. By about 10,000 years B. P. the Peace Hills area became ice-free; and, in the next 1,500 years, a corridor opened to the Arctic region.

People making Clovis and Folsom points may have entered the southern part of the province at the heels of the retreating ice margin, but these point traditions soon passed on. Scattered surface finds of points such as, or similar to, Agate Basin, Angostura, and Hell Gap, of the early Plano culture, are found over much of the province. These points occur in the Northwest Territories and the Yukon, and they appear to date these at about 6-7,000 years B. P. These finds suggest that some early Plano people occupied the land shortly after the ice uncovered it. Bryson and Wendland (1968) have suggested that the opening of an ice-free corridor, about 8,500 years B. P., allowed cold polar air to flow south, dropping winter temperatures in the Northern Plains perhaps as much as 20°C. They present the idea that this unpleasant situation may have been a major factor in the species extinction of large mammals that took place about this time.

The single pollen profile from the Red Deer area in south-central Alberta suggests that a grassland or grassy Parkland existed

at the ice margin during its retreat. From the area of the Peace Hills and north, however, the area apparently became more forested, by a spread of trees from the Cordilleran area and/or from points east along the ice front.

The first intensive occupation of south and central Alberta was by people making Scottsbluff and Eden points (Cody Complex), a later Plano cultural manifestation than Agate Basin points. The Cody Complex has been dated at 6-9,000 years B. P. in the High Plains area. An Alberta point, which is possibly an older variant of the Scottsbluff type, was found at the Bayrock site (Wormington and Forbis 1965) in southern Alberta. A radiocarbon date of 11,000±250 years B. P. was obtained on a log in the same formation but at a lower depth than the point. Also in southern Alberta is the Fletcher site, a Scottsbluff-Alberta kill and butchering station (Forbis 1968) which is geologically dated at about 7-11,000 years B. P. This latter site has bison bone that seems to be within the modern species size range.

The Peace Hills evidence suggests that the earlier Plano people were moving through the area before or during the time the dunes were beginning to form on the dried lake bed. The pollen profiles suggest that the area was essentially forested, perhaps with trees of the Cordilleran and/or Boreal Forest type. At this time the winter temperatures on the Northern Plains may have been as much as 20°C. colder than when the ice sheet was present.

About 7,000 years B. P. the rising temperatures of the period known variously as the Altithermal, Hypsithermal, postglacial Climatic

Optimum, etc., may have ameliorated the situation somewhat. The grasses began to intensify and expand northwards at the expense of the trees, to reach, within the next 2,000 years, the area which is today covered by the southern limits of the Boreal Forest. As the vegetation assumed "dominance" over the winds, dune formation reached the final "parabolic" stage.

The later Plano people, those making Scottsbluff and Eden points, began an intensive occupation of the area, including the Peace Hills, hunting bison of modern species size. As the Scottsbluff material appears to be somewhat limited within the Peace Hills, compared to the rest of central and southern Alberta, it is probable that there was still enough blowing sand at the dune crests to discourage any lengthy stays.

Also in level G were two lanceolate points, one of which is similar to a Plainview. Plainview, or Plainview-like, points commonly occur with Scottsbluff points in surface blowouts in southern Alberta. These appear to be, largely, single occupation sites. Farther to the south in the Central Plains area, Plainviews appear to be somewhat earlier than Cody Complex material. In Alberta, however, they would seem to be contemporaneous.

There was also one large side-notched point (type 4a) and five corner-notched points (type 3a) in level G at the Fullerton site. The former appears to be of the Oxbow type (to be discussed later), while the others are an unknown entity. A corner-notched point, similar in appearance and size to the Fullerton specimens, was found at the

Fletcher site in association with Scottsbluff and Alberta points.

Three microblades and other tools of obsidian were found in this level. Reported finds of microblades are scarce for Alberta. The Little Gem area, near the town of Cereal in southeastern Alberta, yielded microblades (Wormington and Forbis 1965: 60, 83) which may be associated with some nearby Cody Complex material, though there were also some more recent point types in the immediate vicinity. The High River microblades (Sanger 1968), also from southern Alberta, were found in a blowout near an area where Eden, Scottsbluff, and Plainview points had been collected. All of the Fullerton and most of the High River microblades are of obsidian, and this fact suggests some Cordilleran relationship. At the Fullerton site microblades were also found in levels F, C, and B (one in each level). As they appear to be of the same type of obsidian and made by the same technological method, the tradition would appear to be long-lived.

Most of the other tool types in level G were rather undiagnostic, and were also found in the other levels. There were a few bone tools. Bone tools were missing in the middle levels of this site, but this fact may be due to differential preservation.

Level F: Circa 5-6,000 years B. P.

The grassland development reached its greatest extent during the postglacial "Climatic Optimum". Nevertheless, climatic conditions in the Northwest Plains did not compare to those on the High Plains to the south. While grasses saw their greatest development in the northwest, the black soils of the present Parkland area suggest a fairly humid

environment. Certainly they are not of the brown soil type that is typical of the more arid Plains region.

The Meso-Indian stage, that commenced in the previous level, continued with little change other than the disappearance of Scottsbluff and Plainview-like points. Corner-notched points declined in number, and type 3a was limited to one specimen. There were two small, barbed, corner-notched points (type 3b), two stemmed points (type 2c), and three side-notched points (types 4a, b). One microblade and one hafted drill were the only other distinctive tool types found in this level.

In general, occupational debris was no more abundant than in the previous level, and considerably below that found in the overlying level. Probably the wind was still able to move sand at the dune crests, making occupation unpleasant.

Level E: Circa 4-5,000 years B. P.

The environment of grassland, or grassy Parkland, seemed to continue in the Peace Hills. There was a substantial increase in the amount of cultural debris found, as human occupation apparently increased. Possibly the arid conditions in the High Central Plains were driving people out to the fringe areas. Along with bison bone at the Fullerton site, there were remains of elk and beaver, indicating, at least, wooded valleys.

Artifacts increased in number and type. The most common projectile points were side-notched (types 4a, b). Oxbow points (type 4a) are associated with radiocarbon dates ranging from 2,670$\pm$80 years B. C., to 3,400$\pm$250 years B. C. in southern Saskatchewan. A similar

type, the Parkdale Eared (MacNeish 1958a), was found in southeast Manitoba, and is estimated to be from 1,500 to 3,500 years old. A long life-span for this general point type was also indicated at the Fullerton site, as it occurred in all levels, though being most common in levels C, D, and E (ca. 2-5,000 years B. P.). Two McKean lanceolate points (type 1b) appeared for the first time at the Fullerton site in level E. This point type is widespread in space and time over the Northern and Central Plains. Associated radiocarbon dates generally fall within the 3-5,000 years B. P. range, though some dates exceed these limits. Plant food preparation implements such as manos and metates, which are common in the southern sites, have not been found in the northern sites. Apparently the emphasis remained on big game hunting in the Northern Plains.

Corner-notched points and bone tools were absent in level E, but scrapers made of local chert pebbles were common and remained so through the remainder of the levels. Other tools made of pebbles (split-pebble cutting and scraping tools) were also numerous. Most of these exhibited limited usage, being made for the moment and then discarded. Pointed biface tools, presumably used for cutting purposes, were most abundant in this level; and a combination tool (two scraper-spokeshaves) occurred for the first time. A limited amount of ochre was also present, and may indicate some leisure time indulgence in decoration.

Level D: Circa 3-4,000 years B. P.

About this time the grasslands were being encroached upon by

trees, and the Peace Hills began to assume the present-day Parkland type of plant community. This condition continued on up to the historic period with, apparently, minor disruptions caused by fires and short-lived droughts. In all likelihood, wind activity at the dune crests was considerably reduced by tree cover. Both faunal and artifact specimens reached their minimum number in this level. Bison bones again predominated, but there were also moose and beaver remains.

Intensification of forestation in the Peace Hills area was precipitated by an increasingly cooler and more moist condition brought about by widespread and substantial climate change. Porter and Denton (1967) have summarized the evidence for renewed glacier activity, primarily for the North American Cordillera (see also Heusser 1956) but also for other parts of the world. This glacier activity, which may have started as early as 4,600 years B. P., reached a climax about 2,600 years ago, after which there was a gradual decline to present-day conditions. This climatic period is referred to by different names, usually with different implications for different areas. "Medithermal", "little ice age", and "Neoglaciation" are some of the more common terms.

Ice began to form in the highland portions of the Rocky Mountain Range and Cascade Range of the Rocky Mountains about 3,300 years B. P., and persisted until about 900 years B. P. (Richmond, et. al. 1965). About 4,000 years B. P., the glacier ice was reconstituted northwest of Hudson Bay (Flint 1956), and the permanent Arctic ice pack was formed (Brooks 1949). Brooks (1951) compiled data on lake and river level fluctuations, and obtained evidence for a wet period in the

western United States that began more than 2,600 years B. P. This change and the proximity of the Northwest Plains to the Cordilleran glaciers brought an increase in precipitation and/or a decrease in evaporation. With this additional moisture the trees were able to encroach upon the northern grasslands.

Level D at the Fullerton site contained all five of the major projectile point types. Most common were the Oxbow and Parkdale Eared (type 4a), with a few specimens of other side-notched points (types 4b, d). As in the previous level, McKean points were limited to two specimens. There were two rather amorphous corner-notched points and one stemmed point. An ovoid unnotched point appeared for the first time.

"Classic" plano-convex scrapers (type 4) and large "blocky" scrapers (type 8) were particularly abundant. Other scraper types remained in about the same proportions as in the previous levels. Split pebble scrapers (type 1) were still present, but the other types of pebble tools did not appear. Spokeshaves and scraper-spokeshaves were most common in this level. There were also two drills or awls.

Ochre, suddenly abundant, was most common in this level. This material appeared to be of local origin; and possibly came from the same bedrock formations as the mudrocks, some scraps of which had iron oxide encrustations. The occurrence of ochre was possibly a manifestation of the general increase in occupation and cultural activity that was evident for both this level and the overlying level C. The same may be said about the occurrence of a tubular stone pipe,

of which three fragments were found.

With all this increased activity, however, there were no bone tools in evidence. This lack may be a matter of preservation, as mentioned before.

Level C: Circa 2-3,000 years B. P.

The Parkland environment, with dual development of grass areas and forest areas that exists today in the Peace Hills area, seems to have been firmly established by this time. There was a continued emphasis on bison hunting; in fact, no other species were represented in this level. Artifacts and faunal remains were almost as plentiful as in the previous level.

Projectile points were more numerous here than in the previous levels. McKean points were the most common type (type 1b); and the first of the two Hanna-like points (type 2b) appeared. The McKean, Duncan, Hanna points were seen as a related series, each succeeding the other in time, by Richard Wheeler (1954). This model was generally borne out at the Fullerton site. One McKean and one Hanna point occurred in the overlying level B; however, there was a Duncan-like point in level A.

Five specimens of point type 3c, a deeply corner-notched point with tanged or sharp shoulders, were found. These are similar to the Larter Tanged of southeast Manitoba (MacNeish 1958a), which are estimated to date at 3,500-2,500 years B. P.; and were also similar to the more distinctive Pelican Lake point (Wettlaufer 1955), which has an associated radiocarbon date of $293 \pm 100$ years B. C. at the Long

Creek site (Wettlaufer and Mayer-Oakes et. al. 1960). Two of the Fullerton specimens approached the "classic" Pelican Lake in form and workmanship. The others seemed to resemble most closely the Keaster point, defined by Davis and Stallcop (1965) from material obtained at a stratified bison kill and occupation site in northern Montana. Keaster points have an associated radiocarbon dating there of about 2,000 years B. P. Davis and Stallcop feel that the Keaster point may represent a type that is transitional from Pelican Lake to Besant. Similar points occur at other sites in the Northern Plains, such as Red Lodge site, Montana, and in the Upper Level at the McKean site in Wyoming. The Old Women's Buffalo Jump (Forbis 1962a) has similar but not identical points in the same deposits with Besant points, associated with a radiocarbon date of A. D. 310$\pm$60 years. It is not certain as yet that the Pelican Lake people used the bison jump method, which appeared about this time; but similar type points (perhaps transitional to Besant), from the Old Women's Buffalo Jump site, appear to be the earliest point type yet reported in an Alberta jump site.

More certainly Besant points were associated with the early jumps. This point, with an associated radiocarbon date of 375$\pm$325 years at the Mortlach type site in southern Saskatchewan, is found in such stratified bison jumps as Old Women's Buffalo Jump (Forbis 1962a), and the Kenney site (Wormington and Forbis 1965) in southern Alberta. The Muhlbach site (Gruhn 1965), in central Alberta, is a Besant bison kill site on fairly level ground; and, interestingly, nearly all the points are of Knife River "flint". While radiocarbon dating for this point

type suggests a post A. D. 1 development, Wormington and Forbis (1965: 192) suggest that the Sandy Creek component at the Mortlach site, with a radiocarbon dating of 445$\pm$290 B. C., is a part of the Besant complex. As demonstrated at the Muhlbach site, the Besant point is highly variable in form, size, and workmanship. At the Fullerton site there were three points in level C and one in level B that appeared to be Besants. Thus they would be somewhat early in the Besant sequence.

Besant points are of particular interest as they appeared at about the same time that certain other cultural changes were taking place. Buffalo jumps, tipi rings, grooved mauls, appeared or became more common about this time, associated with an apparent increase in population. In addition, pottery, perhaps the earliest in the Northwest Plains, was associated with Besant points at the Walter Felt site (Kehoe 1964) in southern Saskatchewan. This association has been radiocarbon dated at A. D. 354$\pm$70 years. Kehoe mentions that Marvin F. Kivett examined the sherds and noted a similarity to the contemporary Keith Focus sherds in Nebraska. Kehoe points out that this similarity is additional confirmation of Plains bison hunting by Middle Woodland peoples. He suggests that they may have returned seasonally to their eastern villages. This hypothesis gains further support by the heavy incidence of Knife River "flint", from North Dakota and/or southern Manitoba, at the Muhlbach site.

Fullerton type 4a points (Oxbow, Parkdale Eared) were still as common in level C as in the preceding two levels. One specimen each of points similar to the Plains and Prairie Side-notched also

occurred. There were two stemmed-waisted points (one being a Hanna type), and one unnotched ovoid point.

The other artifact types continued in much the same proportions as in the previous levels. A microblade was also found. Split pebble tools made a return, being absent in the previous level; and remained present throughout the overlying levels.

Level B: Circa 1-2,000 years B. P.

Though the Parkland environment appeared to continue, there was a lesser amount of cultural debris, including faunal remains. Bison hunting was still most commonly practiced, and there are also beaver, deer, and canid remains.

This is the Neo-Indian stage, which is characterized by the appearance, or increase in usage, of small side-notched points (thought by some to represent the initial occurrence of the bow and arrow in the area), and an intensification of those cultural changes mentioned previously. An exact division between the Meso- and Neo-Indian stages is difficult to delineate due to some time differences between the appearances of certain traits.

In the Northern Plains there was an increase in the number of sites and the debris they contained. Seemingly there was an expansion in population, which was possibly due to the increased and steadier food supply made possible by the communally-operated bison jump. Hurt (1962) has suggested that there was an increase in the number of bison on the Northern Plains about this time. There was, however, a decrease in occupational debris at the Fullerton site, and

this situation was the same for level A. Part of the apparent population increase on the Plains may have been due to a migration of people, perhaps seasonally, from the Parklands. Certainly the open Plains with its steeply eroded river banks offered better situations for the establishment of bison jumps. There is also the possibility that an increasing forest-over-grass ratio in the Parklands drove many of the bison southwards onto the Plains.

At the Fullerton site corner-notched points disappeared in level B, and there was a corresponding increase in the numbers of small side-notched points. The larger side-notched points were still present (larger specimens of types 4a, b, c) but in dwindling numbers, and there was one McKean and one Hanna point present. There were three specimens of the Prairie Side-notched point (MacNeish 1958a), a common type over the Northern Plains; and, by similar types, over the whole continent. MacNeish estimates their appearance in southeast Manitoba at about A. D. 1,000, and they continued there until proto-historic times. Kehoe, in his definitive work "The Small Side-notched Point System of the Northern Plains" (1966b), observes that they seem to occur earliest, in the Northern Plains sites, at the Gull Lake bison drive site in southern Saskatchewan. At this site the point type has an associated radiocarbon date of A. D. 730$\pm$80 years.

There is an earlier side-notched point in the Small Side-notched Point series, the Avonlea, which has an associated radiocarbon date of A. D. 210$\pm$60 years at the Gull Lake site. No specimens of these distinctive, delicately-made points were found in the Peace Hills

material. While these points occur most commonly in bison jump sites and in blowouts in the Northern Plains area (Davis 1966), Dr. Ruth Gruhn recovered one at a Calling Lake site (personal communication) which is situated in the Boreal Forest region of north-central Alberta. The Sekirsky site (see Wormington and Forbis 1965: 169), also within the Boreal Forest of Alberta, reportedly contained an Avonlea point, and with pottery in possible association.

Two Plains Side-notched type points (MacNeish 1958a) were also found in level B at the Fullerton site. MacNeish estimates their time range in southeast Manitoba as being about the same as for the Prairie Side-notched; _i.e._, _ca_. A. D. 1000 to proto-historic times. Kehoe's work (1966b) suggests a starting date, or at least greatly increased numbers, for this point type from A. D. 1590 to proto-historic or historic times. There are, however, many similar but more generalized types appearing a little earlier in time over much of North America; and, seemingly, the Fullerton types found in level B are of this nature.

Split pebble and "classic" plano-convex scrapers were common in this level. One microblade and two hammerstones also occurred. Bone tools increased in number. Three pot sherds were excavated, but these were likely associated with the pottery in the overlying level. The largest number of obsidian artifacts were found in this level, though all were merely waste flakes with some signs of chipping and wear.

Level A: _Circa_ 0-1,000 years B. P.

The environmental picture remained constant though there may

still have been some increasing forestation, at the expense of grass, in the Parkland region.

The decline in cultural material and faunal remains, that started in the preceding level, continued in this level. The increasing popularity of bison jumps seemingly continued to draw people from the Parklands to the Grasslands. With the advent of the historic stage and the fur trade, the Peace Hills seems to have become deserted. The only two European items found were two beads, neither of which came from the Fullerton site. Presumably the Indian population was moving directly from the fur trade posts to bison jump areas and/or to fur trapping areas along waterways and around lakes. Possibly it was no longer economically feasible to sit on a hilltop waiting and watching for game in the Parklands area. To obtain substantial amounts of bison hides and flesh, a band likely headed out onto the Plains to a jump site. For the smaller fur-bearing animals such as beaver, mink, etc., the band would seek the streams and ponds within the Parkland and Boreal Forest area. There may be some significance to the fact that the two European-made beads were found adjacent to the streams that meander through the north end of the Peace Hills.

Warfare between tribes during the fur trade period also may have helped make a "no-man's land" out of the Peace Hills area. Peace treaties are commonly signed in such border areas. In any case, the Woods Cree to the north and the Blackfoot to the south settled their differences and signed a short-lived peace treaty in A. D. 1867 on these hills.

The most common point type in level A was the Plains Side-notched (type 4e). Some were delicately made, rivalling Avonlea for excellence. Also present was one of the larger side-notched points (type 4a: Oxbow, Parkdale Eared), 2 unnotched ovoid points (type 5), and 2 stemmed points (types 2b, c). A Scottsbluff point that had been resharpened in recent times was also found.

All scrapers except type 7 ("nosed" scraper) were present. Most common by far was type 4, the "classic" plano-convex end and side scraper. Bone and pebble tools were in good number. Pottery types 2, 3, and 4 were present (type 1 could not be assigned to a level). Fullerton type 1 shows some similarities to Mortlach Check-stamped (ca. A. D. 1780), and to Fall River type 5 (ca. A. D. 1500-1600) at the Long Creek site, both sites being in southern Saskatchewan. Fullerton type 2 shows limited similarities to Moose Jaw Cord-marked (ca. A. D. 1780) at the Mortlach site. Fullerton types 3 and 4 seem unlike any reported types. Site FfPi102 yielded a few sherds of Pisamiks tradition pottery of Wascana and, possibly, Ethridge ware (Kehoe 1959). Kehoe's article locates Wascana ware in south Saskatchewan, where it appears to be associated with bison drives and small side-notched points of the late prehistoric period. Ethridge ware is found in south and central Alberta at about the same time period and in similar situations. Kehoe suggests that the former may be associated with the Cree and the latter with the Blackfoot. However, the Assiniboine and Gros Ventre, who were also in the area, could conceivably have been involved.

The upper limit of level A is the interface of the grey-black

sand zone (or vegetation litter, where it is present), and the recent yellow sand deposit (see Figs. 8, 9). In the first instance, the aboriginal material ceased at the surface of the interface. In the second instance, the material ceased in the rather mixed and indefinite interface of upper grey-black sand and the vegetation litter. In the middle and upper parts of this litter were found a few crushed tin cans and rifle cartridge cases dated 1917 and 1941.

## The Significance of the Peace Hills Archaeological Investigation

The information obtained bears out what little is known about the archaeology of south and central Alberta. The Peace Hills area was apparently always closely associated with the Northwest Plains' big game hunting way of life. At the present time even less is known of the subsistence pattern of the Boreal Forest to the north. The Parklands area is transitional from grasslands to forests, but extensive grassy flats allowed habitation by herds of Plains bison. Woodland species of animals were little relied upon and were presumably utilized only when the opportunity arose, or when the Plains bison moved southwards in the winter.

The knowledge gleaned from pollen analysis, a few radiocarbon dates, geomorphology of the area, soils formation, and the earliest cultural material in the Peace Hills, indicates a certain progression of postglacial events that have hitherto been little investigated. The work of Bryson and Wendland suggests that the area became ice-free about 10,000 years B. P. Stalker demonstrates that a proglacial lake was created at the retreating ice margin. As the ice margin withdrew to

the north and northeast the lake became a more normal type; that is, there was no longer an inflow of glacial melt-water to facilitate varve deposition. This lake soon drained, leaving only smaller lakes and sloughs in the low-lying areas. About this time (ca. 8,500 years B. P.) cold polar air began to flow south through an ice-free corridor. Early Plano people, those making Angostura and Agate Basin points, were moving northwards through the area, hunting, possibly Bison occidentalis and/or Bison bison athabascae, in an essentially forested environment.

By about 7,000 years B. P. the temperature had begun to rise, and the wind lost its "dominance" over the sand to the encroaching vegetation. "Windrift" and "elongate blowout" dune types had been created. Now the large "parabolic" dunes started to form, as vegetation began to limit sand movement. The grasses-composites-chenopods intensified and expanded northwards through the Peace Hills and beyond, attracting the Plains bison of modern species size, and the later Plano people (those making Scottsbluff, Eden, and Plainview or Plainview-like points). Cody Complex material (Scottsbluff and Eden points, Scottsbluff knives), while fairly common in southern and central Alberta, appears to be comparatively limited in the Peace Hills. In all likelihood the sands were still sufficiently mobile within the Peace Hills area to make occupation unpleasant. This situation continued through the next 2,000 years, during which time the grasses had their maximum development and extension northwards.

The presence of three obsidian microblades in level G at the Fullerton site, and the possible association of obsidian microblades

with Scottsbluff points near Cereal and High River in southern Alberta, suggests that the northern Cody Complex people were familiar with true blades, by trade and/or manufacture, made from material foreign to the Plains area. The presence of corner-notched points (type 3a), in this same level at the Fullerton site, adds another point type for this time period. A similar point was also found at the Fletcher site (Forbis 1968) in southern Alberta. At present, the relationships of this point type are unknown.

Point types 1b (McKean lanceolate) and 4a (Oxbow and Parkdale Eared) seem particularly long-lived at the Fullerton site. The increasing number of radiocarbon dates obtained for McKean sites (see Neumann 1967) is beginning to demonstrate a considerable time span for the existence of this point type. Radiocarbon dates for Oxbow and Parkdale Eared points are limited, but the Fullerton data suggest that this general type of point also enjoyed a long-lived popularity. Perhaps when sufficient numbers of these points in dated contexts are found, statistical treatment, as was done by Forbis (1962a) and Kehoe (1966b) on the recent small side-notched points, may delineate more specific features.

The decline in the amount of cultural material for the upper two levels (ca. 0-2,000 years B. P.) at the Fullerton site, coupled with an apparent increased population in the Plains area, is very suggestive. While more archaeological work will be needed to demonstrate this hypothesis, there may have been a movement of people, perhaps seasonally, from the wooded areas to the grasslands over this time span.

The reason for such a movement is uncertain though a possible decline in the number of bison frequenting the Parklands, and an improved food supply obtained by the bison jump method, may be the answer.

The almost total absence of European trade items in the Peace Hills area is also suggestive of different habitation patterns. To obtain furs for trading purposes the Indians may have moved directly from the fur trade posts to the bison herds and jump areas on the Plains, and/or to the waterways within the Parkland and Boreal Forest, and then directly back again to the posts again. In addition, certain areas between hostile tribes may have been avoided to reduce the possibility of contact.

The Peace Hills archaeological project suggests certain possibilities for future investigation in Alberta, and perhaps in other areas with similar physical features. Large parabolic dunes, being stationary and fairly stable landform features of considerable life span in this area, may contain cultural sequences of some antiquity. In general, they are located on old glacial lake bottoms and are usually the highest landform in the area. They offer good viewing situations to the hunter, and there are frequently residual lakes and sloughs nearby to supply water for both man and animal. There are over two dozen other major dunal areas in Alberta alone (Odynsky 1958). While those in the Plains area of the province have likely been subjected to much wind activity and deflation, those farther north in the Parkland and Boreal Forest have had good protective cover for a considerable length of time. As these two regions are unknown entities,

archaeologically speaking, an investigation of the larger parabolic dunes could add substantially to the knowledge of North American prehistory.

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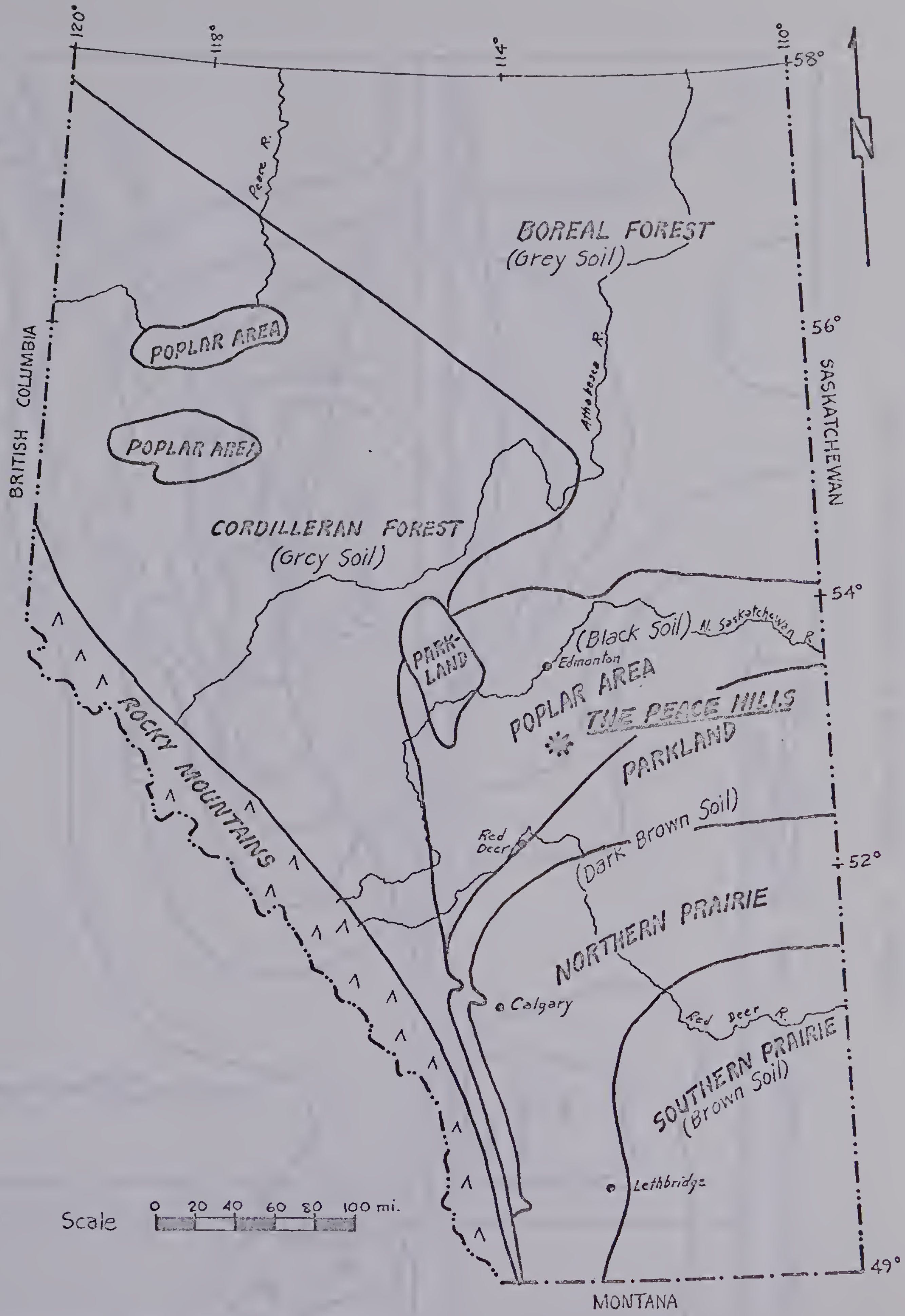


FIGURE 5. PRESENT FLORAL AND SOIL ZONES OF SOUTH AND CENTRAL ALBERTA (AFTER HANSEN, 1949).

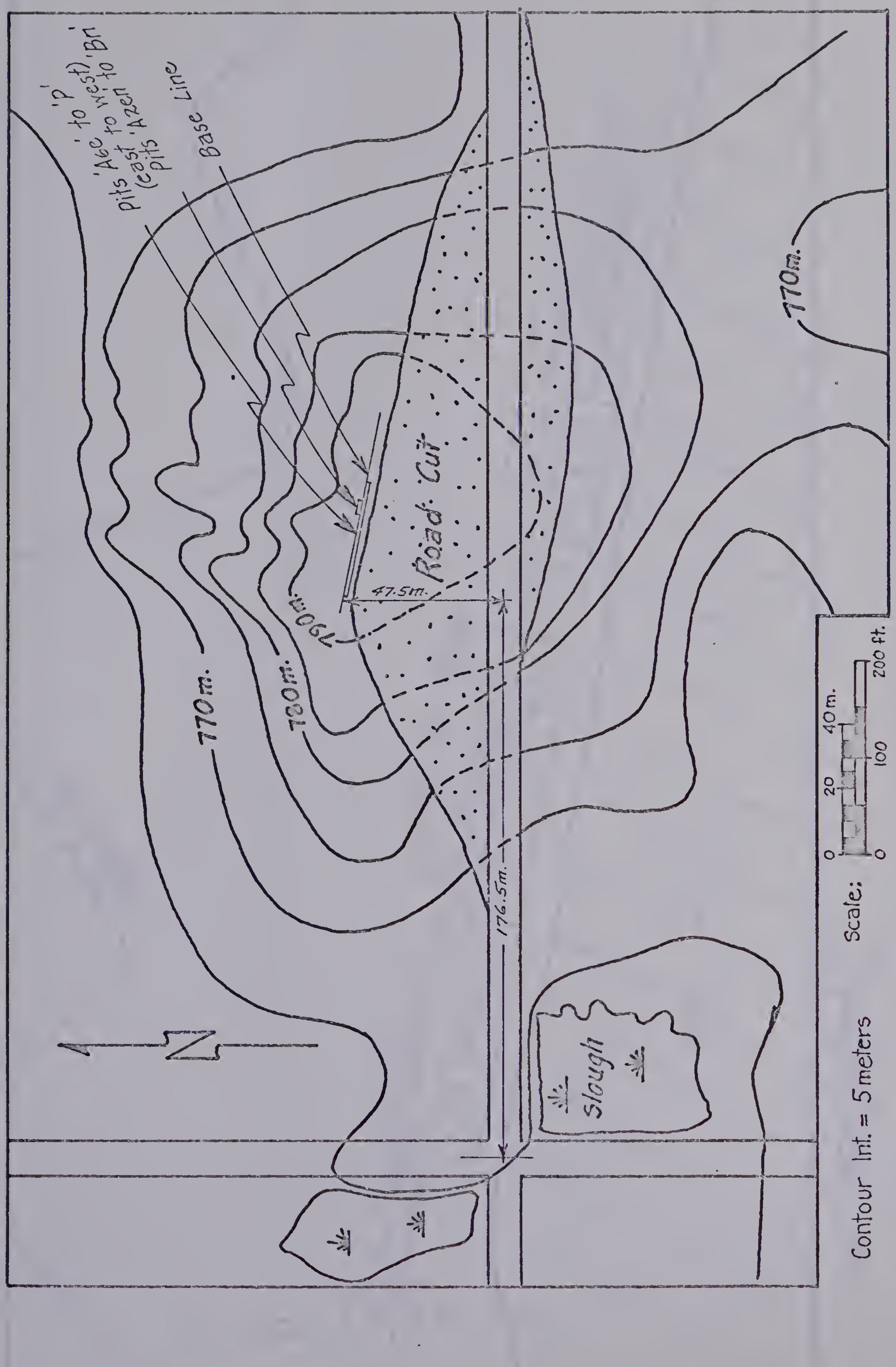


FIGURE 6. CONTOUR MAP OF FULLERTON SITE DUNE.

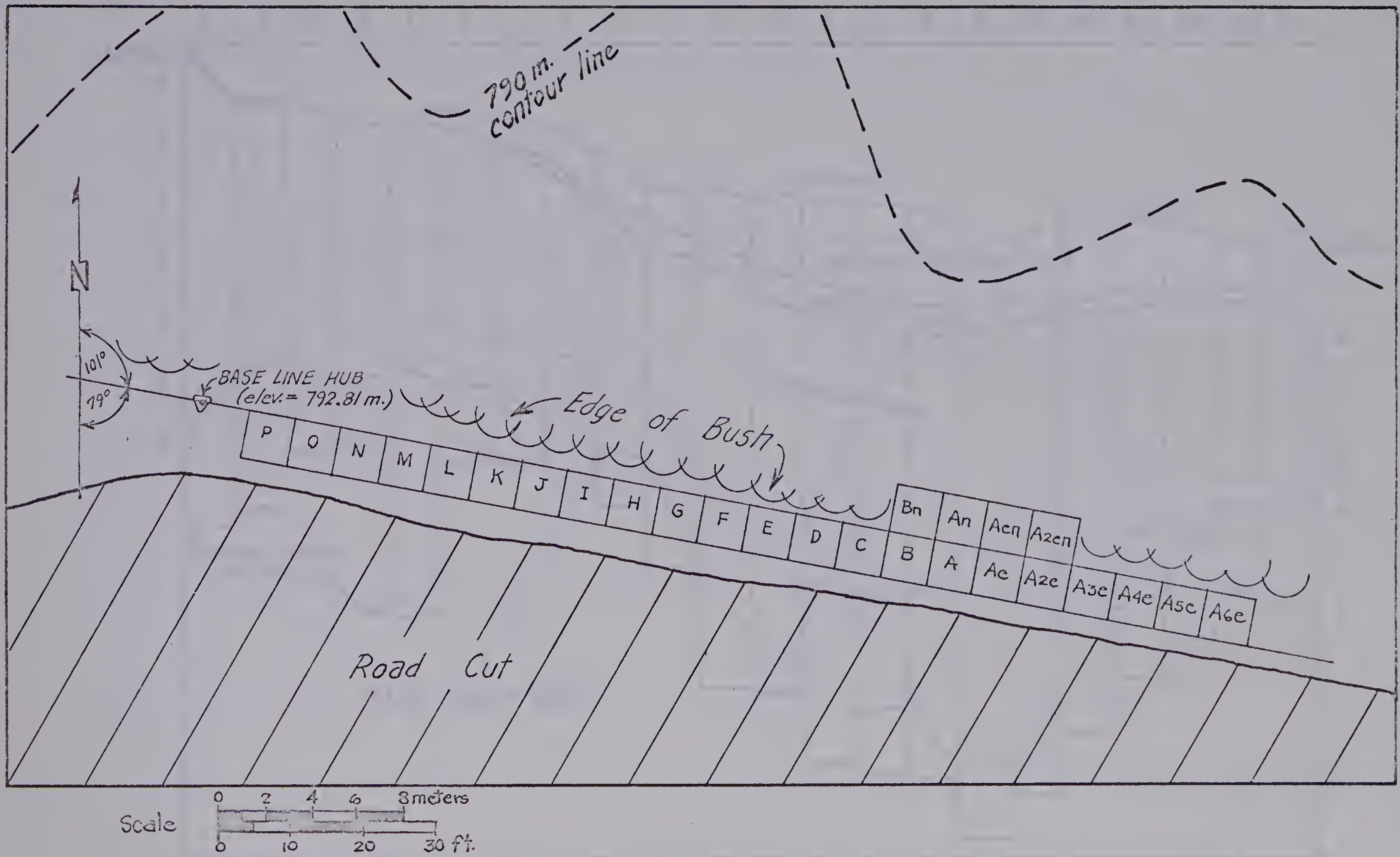


FIGURE 7. FULLERTON SITE PIT LOCATIONS.

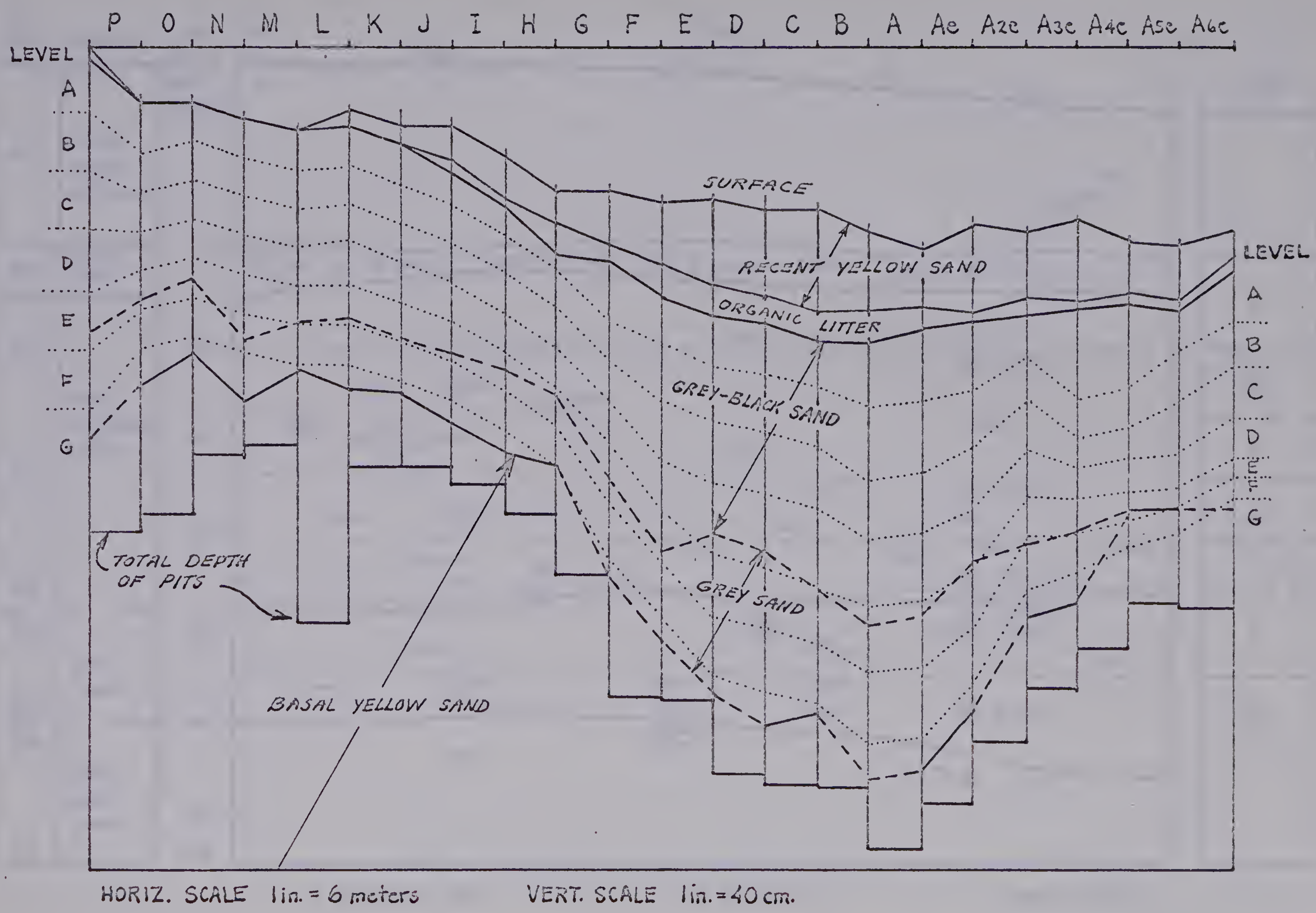


FIGURE 8. SCHEMATIC CROSS-SECTION PITS A6e TO P.

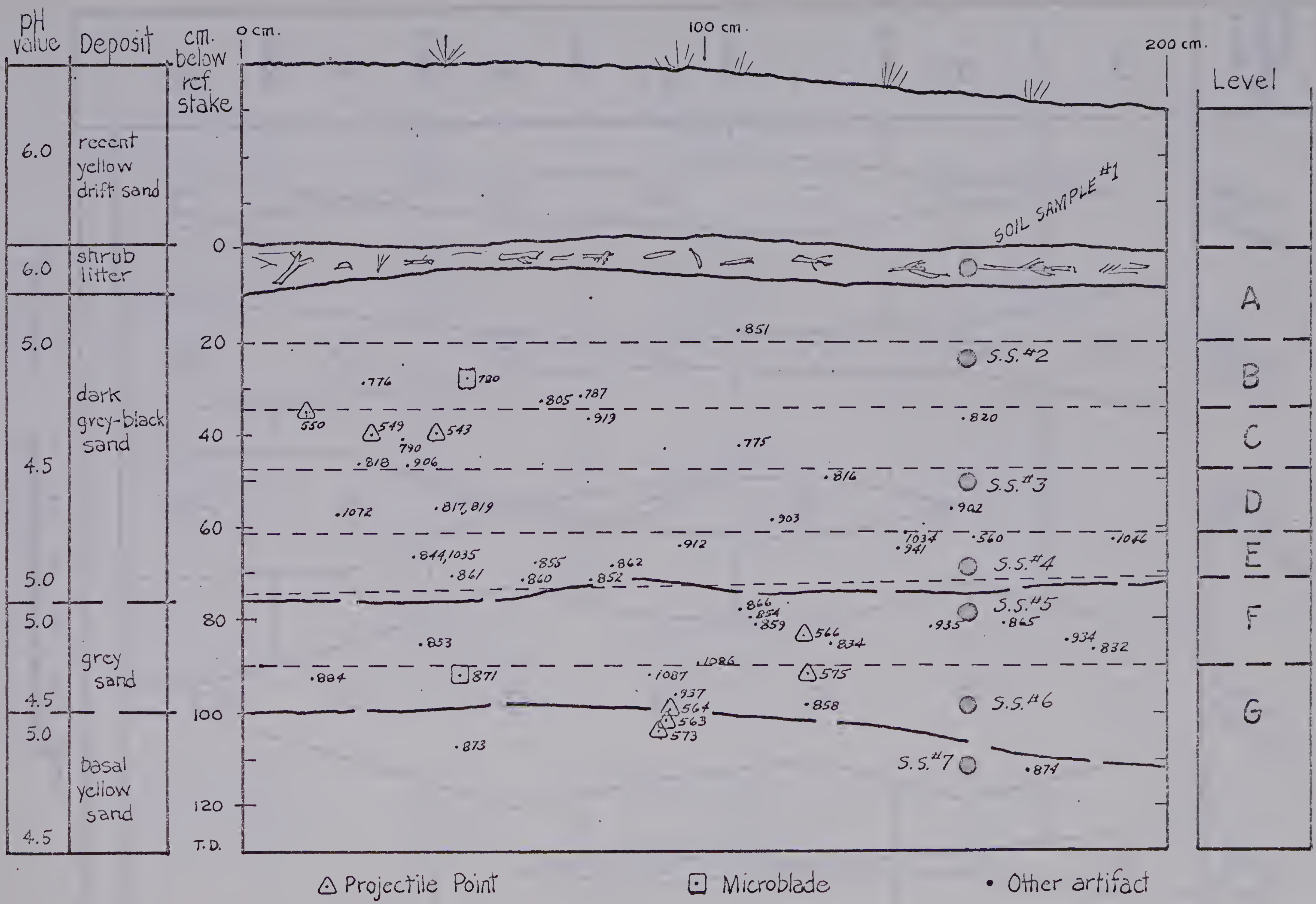


FIGURE 9. SOILS CROSS-SECTION AND ARTIFACT LOCATIONS, PIT Bn.

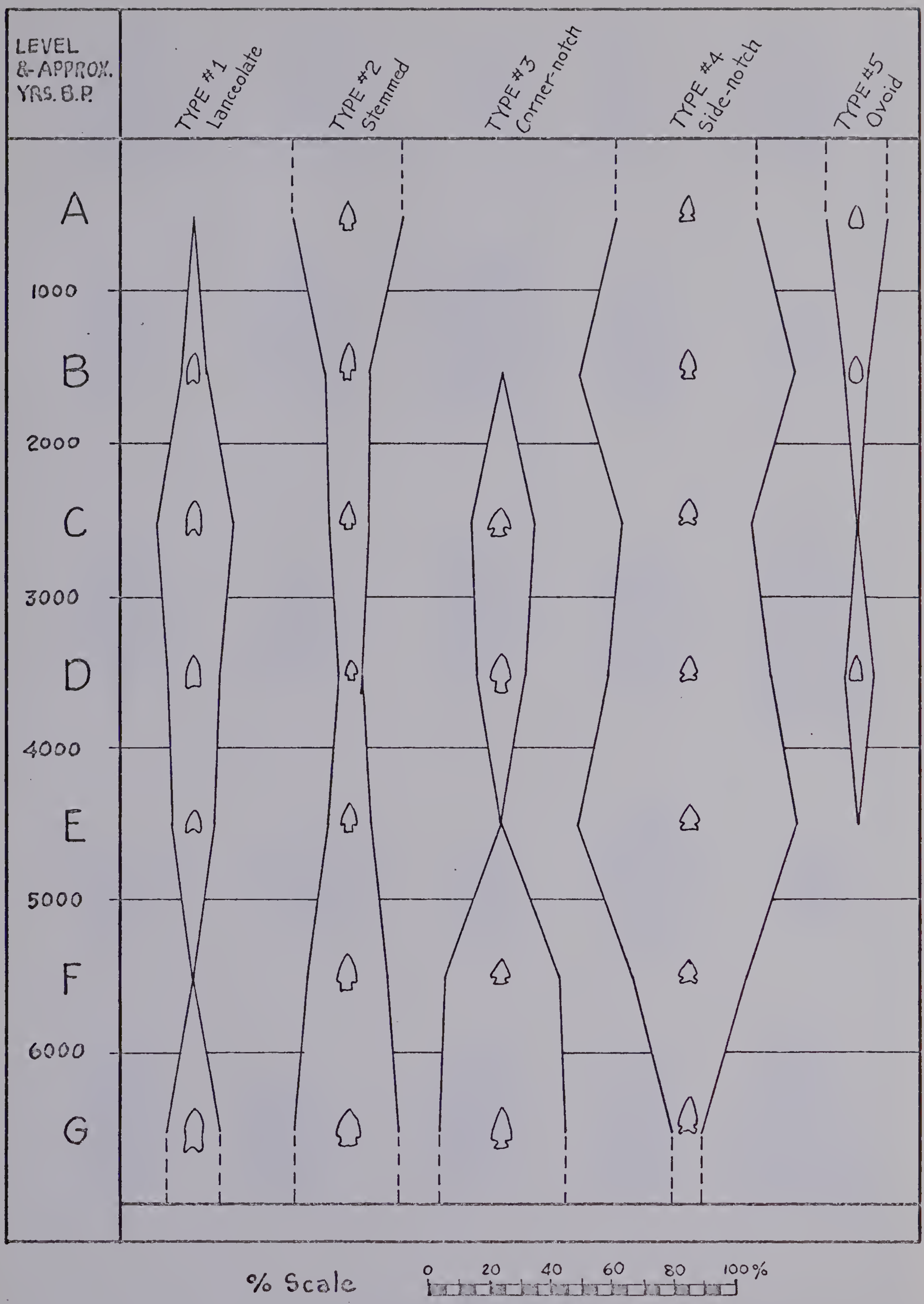


FIGURE 10. PERCENT FREQUENCY OF PROJECTILE POINT TYPES BY LEVELS.

FIGURE 11. PROJECTILE POINTS.

By Levels:

Level A: a-d
Level B: e-j
Level C: k-t
Level D: u-y

Point Types:

1b: l, m, n
2c: k
3c: p, q
3d: u
4a: b, g, h, o, x, y
4b: r, v, w
4c: e, s
4d: i
4e: c, d, f, j, t
5 : a

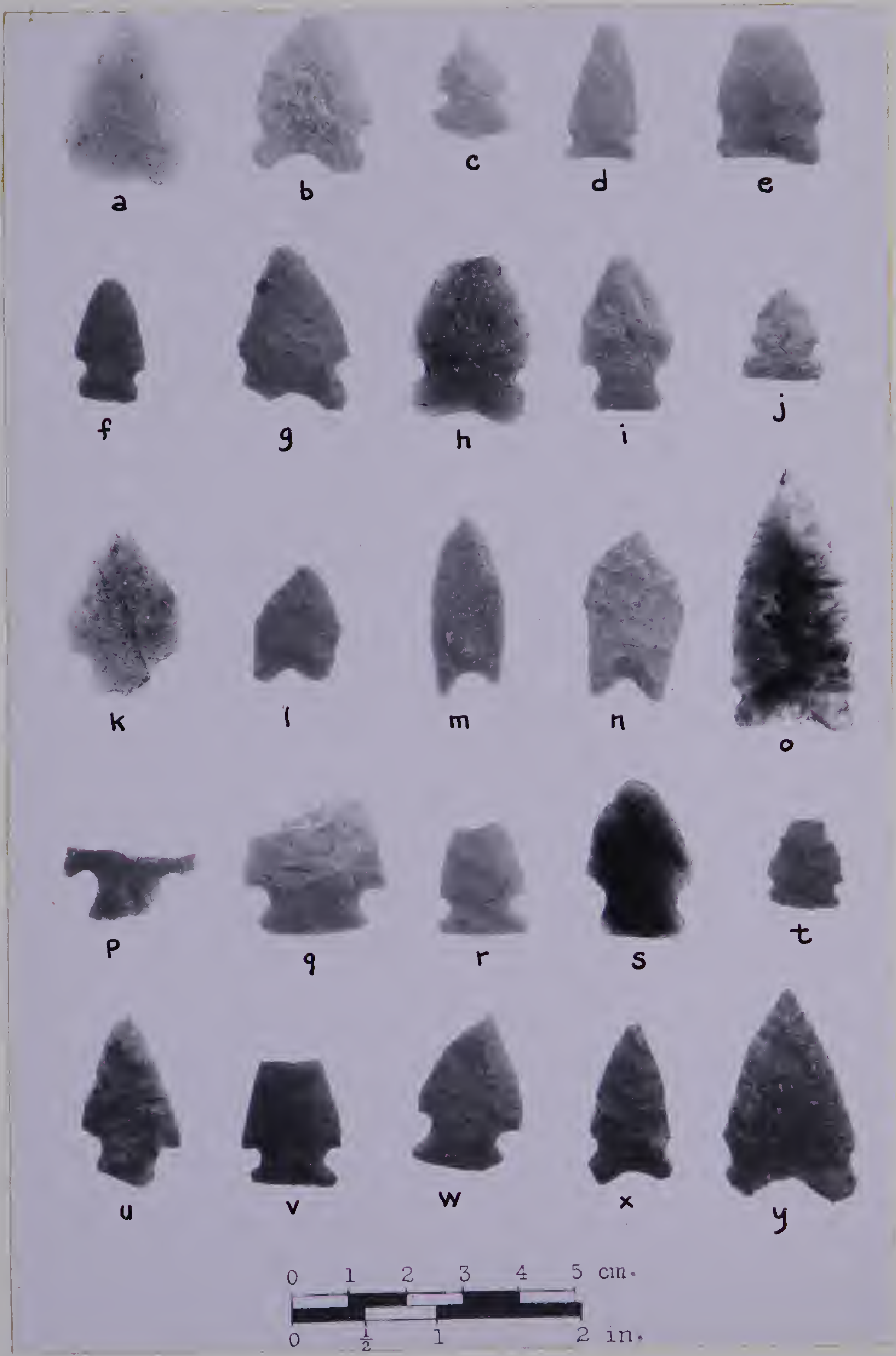


Figure 11 - Projectile Points.

FIGURE 12. PROJECTILE POINTS.

By Levels:

Level A: p
Level E: a-e
Level F: f-i
Level G: j-o, q
Unassigned: r-t

Point Types:

1a: n, q
1b: d, e
2a: o, p
2c: f
3a: k-m
3b: h, i
3c: t
4a: a, g, j
4b: b, c, s
5 : r


Figure 12 - Projectile Points.

FIGURE 13: SCRAPERS, SCRAPER-SPOKESHAVES, SPOKESHAVES, SPECIAL TOOLS.

Scrapers:

Type 1: a, b, d, e
Type 4: c

Scraper-Spokeshaves:

g, h, l

Spokeshaves:

i, k

Special Tools:

Perforator: f
Hafted knife: j


Figure 13 - Scrapers, Scraper-Spokeshaves, Spokeshaves, Special Tools.

FIGURE 14. BIFACES AND UNIFACES.

Bifaces: a-c

Unifaces: d-f


Figure 14 - Bifaces and Unifaces.

FIGURE 15. MICROBLADES, CORES, DRILLS OR AWLS, SPLIT PEBBLE TOOLS.

Microblades:

Primary ridge flake: b
Secondary ridge flakes form B: a, d, e
"True" microblades: c, f

Cores: g-i

Drills or Awls: j-l

Split Pebble Tools: m-q


Figure 15 - Microblades, Cores, Drills or Awls, Split Pebble Tools.

FIGURE 16. POTTERY AND PIPE.

Pottery:

Fullerton Type 1: c
Fullerton Type 3: a, b
Wascana ware: d, e

Pipe: f-h

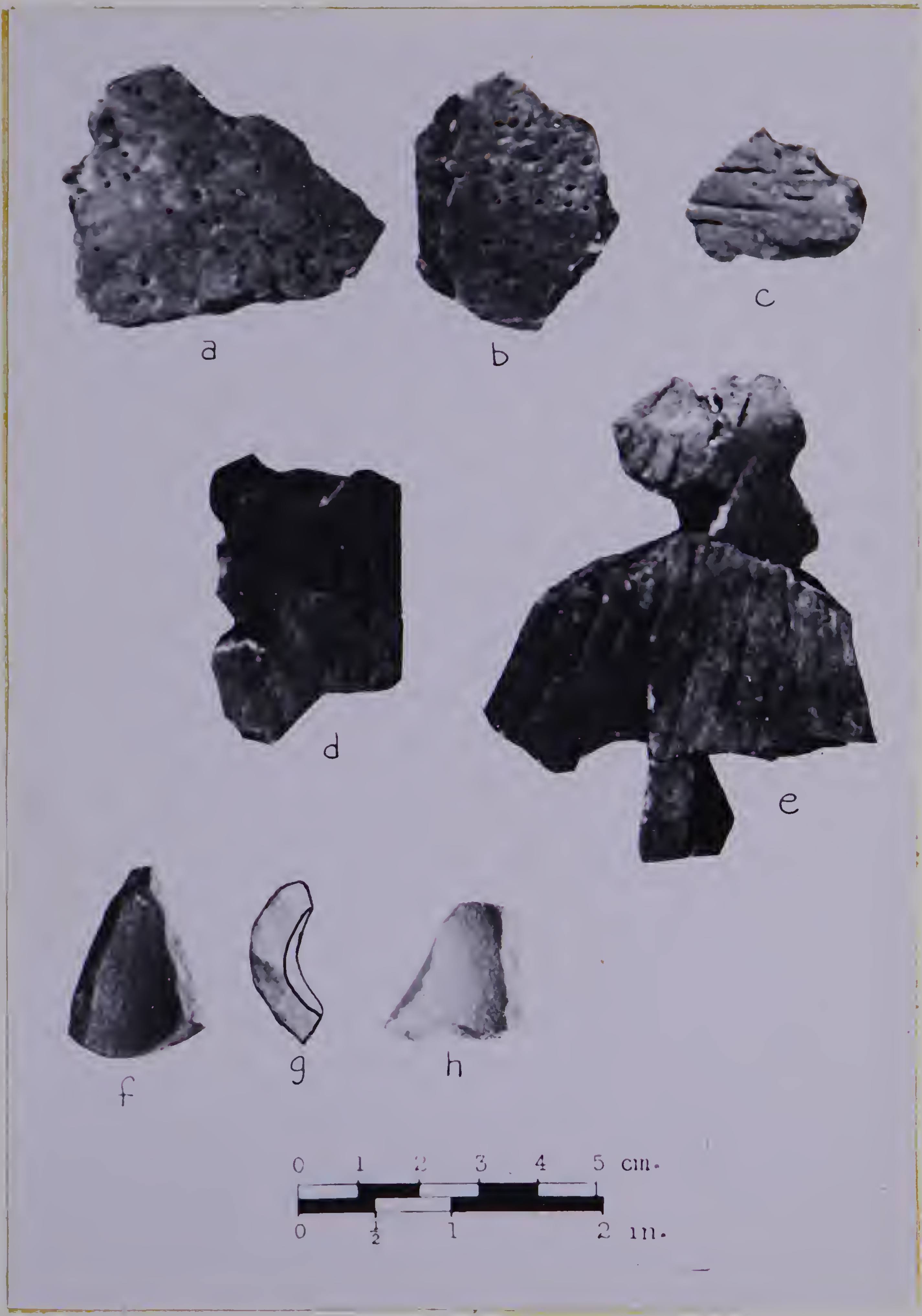


Figure 16 - Pottery and Pipe.

FIGURE 17. BONE TOOLS.

Flaking Tool?: a
Pot Scraper?: d
Rubbing or Abrading Tools: b, c


Figure 17 - Bone Tools.

FIGURE 18. STAN REYNOLDS' ARTIFACT COLLECTION.

Projectile Point Types:

Type 1b: f, g
Type 2b: b
Type 3a: h, j-l
Type 4d: a, e, i
Type 4e: d
Type 5 : c

Lerma Point: m

Abrading Tool: n

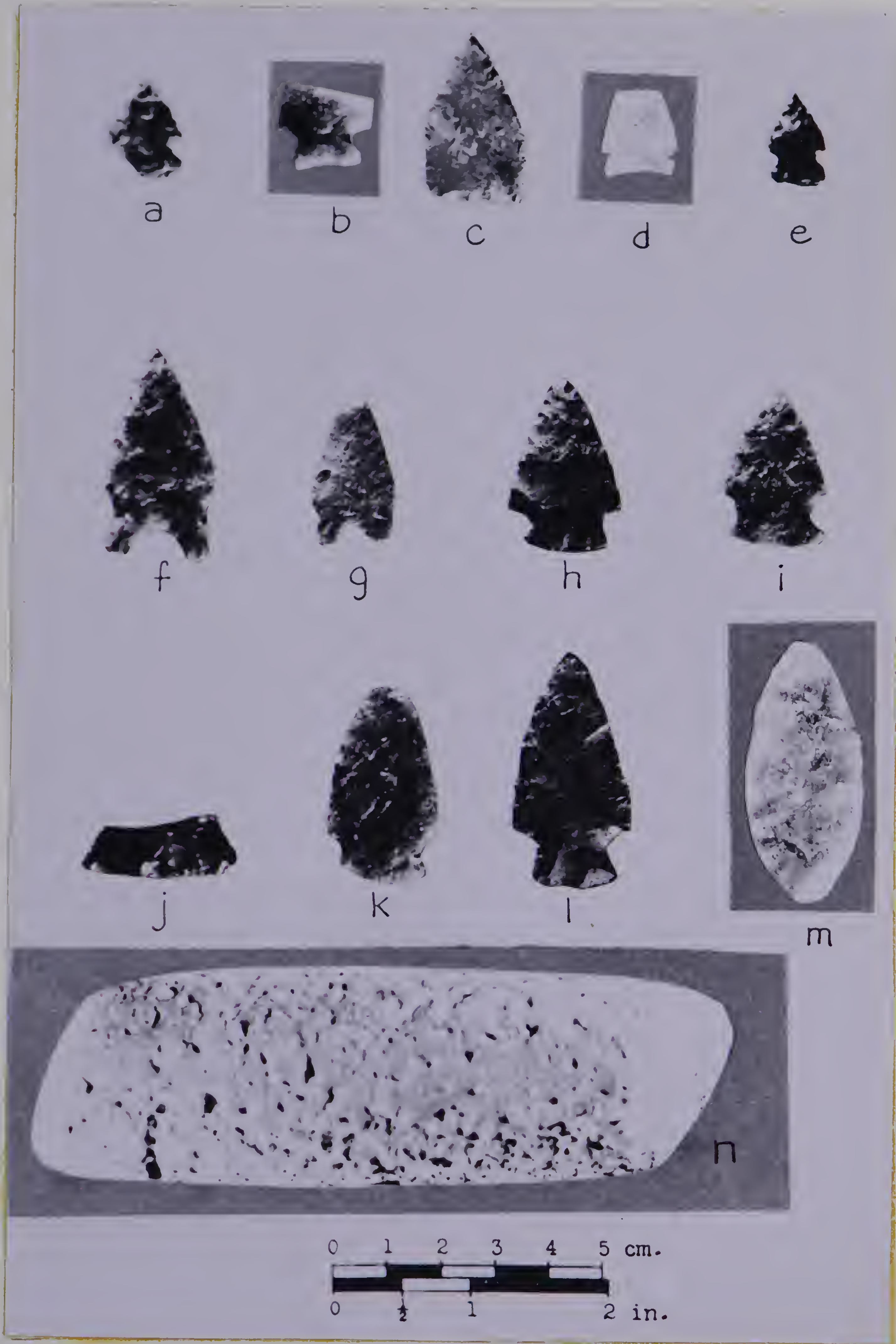


Figure 18 - Stan Reynolds' Artifact Collection.

# APPENDIX A: SIEVE AND HYDROMETER ANALYSES

Seven soils samples were taken over the upper 120 centimeters of square 'Bn' at the Fullerton site (see Fig. 9 for sample location), and one sample was taken from deep in the road cut of the same dune. Using standard methods (see Cornwall 1958: Chapter 11) 100 gram samples were prepared. Samples No. 1 and No. 7 were tested by the hydrometer method to determine the amount of silt and clay. All samples were wet-sieved to determine the amount of sand. The results are presented here as Fig. 19.

The sigmoid curves obtained and the grain sizes are typical of wind-borne sediments (less than 0.2 mm.) with some saltation evident (greater than 0.2 mm., see Butzer 1964: 188). The individual grains exhibited the "frosted" appearance usually thought to be indicative of wind action. In mineral composition the grains were mainly quartz and felspar with some limestone, dolomite, and heavy minerals.

Sample Nos. 2 and 3 were almost identical in content and were plotted in Fig. 19 as a single line. Sample No. 7 corresponded to the sample taken from deep within the road cut in the basal part of the dune.

From the lowermost samples to the uppermost there is a gradual decline in grain size. This distribution indicates a gradual decline in wind velocity and increasing vegetational control from the time the dune reached its present form and height about 7,000 years B. P. up to the present time. The 0.1 to 0.12 mm. size range of "fine sand" shows some minor exceptions which may be due to the vagaries of curve plotting or to some wind eddying at the dune top.

Sample Nos. 2 and 3 are anomalous below the 0.1 mm. size. There is less very fine sand, silt, and clay here than in the other samples. These two samples were taken from levels B to D (ca. 1-4,000 years B. P.) when cooler and perhaps moister conditions seemed to be intensifying forestation at the expense of the grasses. Seemingly, this phenomenon should have occurred earlier in time when the grasses had their maximum development, and when winds presumably were more effective in winnowing out the finer fractions. Eluviation, the leaching of mineral plant foods and decomposition of organic matter, may only be a partial explanation in the case of sample No. 2, for this process is not strongly developed on the dune crest. A possible explanation may lie in the fact that there was an apparent increase in human occupation of the dune for most of this time period. Increased traffic may have kept the dune surface somewhat churned up, allowing the wind to take away more of the finer fractions.

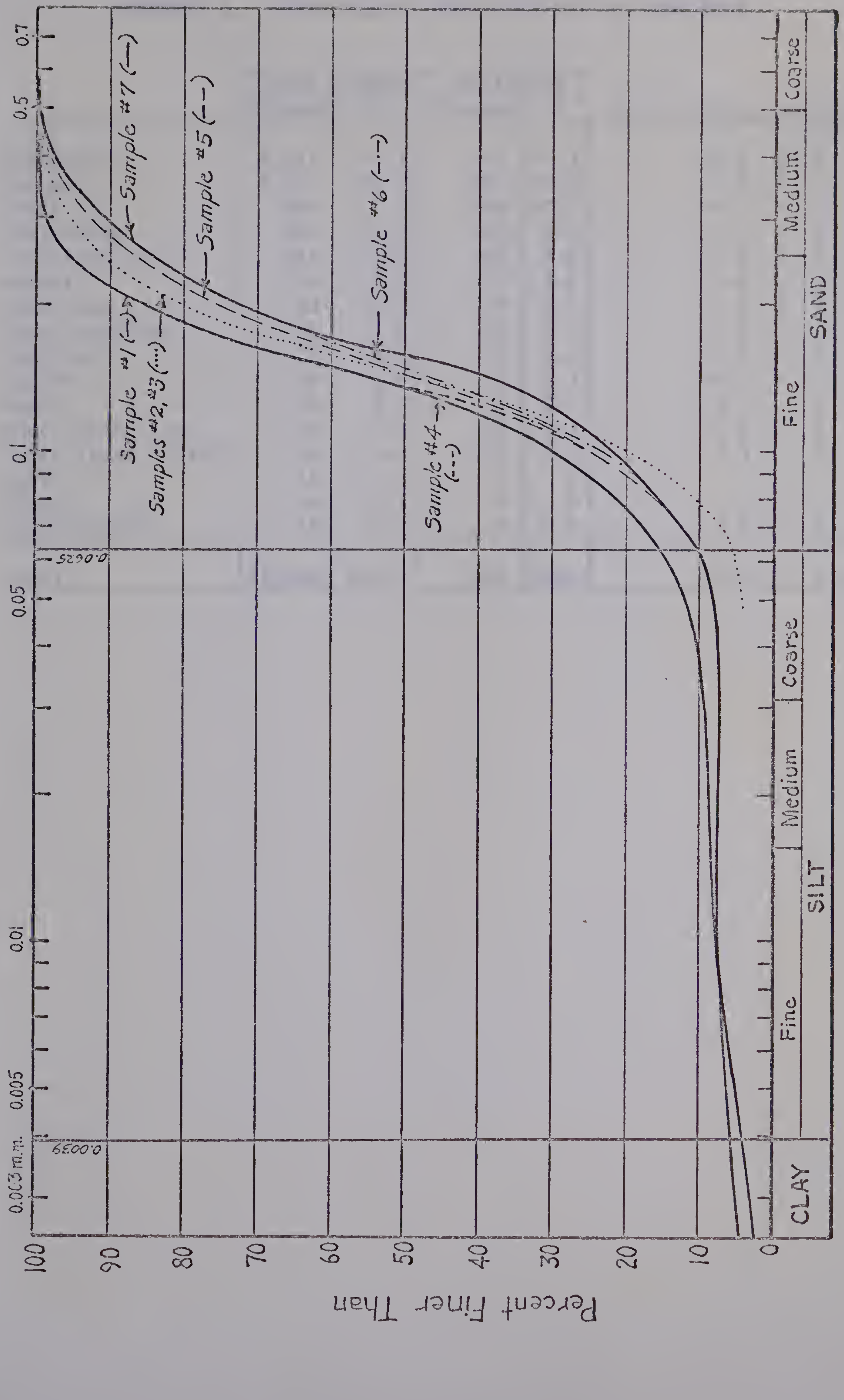


FIGURE 19. MECHANICAL ANALYSIS OF FULLERTON DUNE DEPOSIT.

APPENDIX B. WASTE FLAKES AND ARTIFACTS BY ROCK TYPE

| | WASTE FLAKES | | ARTIFACTS | | |
|---|---|---|---|---|---|
| | Number | % | Number | % | Ratio Flakes to Artifacts |
| Quartzite | 8,111 | 70.5 | 323 | 32.5 | 25.0 : 1 |
| Mudrock | 1,454 | 12.6 | 162 | 16.3 | 9.0 : 1 |
| Chert | 997 | 8.7 | 226 | 22.7 | 4.4 : 1 |
| Chalcedony | 294 | 2.6 | 89 | 9.0 | 3.3 : 1 |
| Petrified wood | 219 | 1.9 | 38 | 3.8 | 5.8 : 1 |
| Quartz | 99 | 0.9 | 24 | 2.4 | 4.0 : 1 |
| Sandstone | 63 | 0.5 | 9 | 0.9 | 7.0 : 1 |
| Clay ironstone | 55 | 0.5 | 12 | 1.2 | 4.6 : 1 |
| Obsidian | 55 | 0.5 | 54 | 5.4 | 1.0 : 1 |
| Jasper | 50 | 0.4 | 3 | 0.3 | 16.7 : 1 |
| Agate | 29 | 0.3 | 3 | 0.3 | 9.7 : 1 |
| Chert-chalcedony | 26 | 0.2 | 23 | 2.3 | 1.1 : 1 |
| Knife River "flint" | 20 | 0.2 | 15 | 1.5 | 1.3 : 1 |
| Shale | 10 | 0.1 | 0 | 0 | |
| Slate | 6 | 0.1 | 0 | 0 | |
| Unidentified | 18 | 0.2 | 9 | 0.9 | 2.0 : 1 |
| Total | 11,506 | 100.2 | 995 | 100.0 | 11.6 : 1 avg. |

APPENDIX C. ROCK ARTIFACT MATERIAL BY LEVELS

| LEVELS | A | B | C | D | E | F | G | TOTAL | % |
|---|---|---|---|---|---|---|---|---|---|
| Quartzite | 34 | 38 | 51 | 49 | 36 | 39 | 34 | 281 | 31.6 |
| Sandstone | 1 | 2 | 0 | 1 | 3 | 1 | 0 | 8 | 0.9 |
| Quartz | 1 | 4 | 2 | 4 | 2 | 2 | 5 | 20 | 2.3 |
| Mudrock | 14 | 19 | 23 | 30 | 25 | 15 | 14 | 140 | 15.8 |
| Chert | 26 | 33 | 35 | 48 | 26 | 21 | 11 | 200 | 22.5 |
| Clay ironstone | 1 | 1 | 1 | 1 | 4 | 2 | 0 | 10 | 1.1 |
| Chert-chalcedony | 9 | 2 | 1 | 3 | 1 | 1 | 1 | 18 | 2.0 |
| Chalcedony | 9 | 13 | 13 | 11 | 15 | 7 | 14 | 82 | 9.2 |
| Knife River "flint" | 2 | 2 | 3 | 2 | 2 | 0 | 2 | 13 | 1.5 |
| Agate | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0.1 |
| Jasper | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 3 | 0.3 |
| Obsidian | 2 | 12 | 7 | 8 | 7 | 6 | 8 | 50 | 5.6 |
| Petrified wood | 10 | 13 | 4 | 2 | 0 | 3 | 1 | 33 | 3.7 |
| Unidentified | 7 | 4 | 3 | 2 | 4 | 0 | 1 | 21 | 2.4 |
| Total | 117 | 143 | 144 | 171 | 126 | 97 | 92 | 890 | |
| % | 13.1 | 16.1 | 16.2 | 19.2 | 14.2 | 10.9 | 10.3 | | 100.0 |

APPENDIX D. ARTIFACT TYPES BY LEVELS

| LEVELS | A | B | C | D | E | F | G | UNAS-SIGNED | TOTAL | % |
|---|---|---|---|---|---|---|---|---|---|---|
| Projectile pts. type 1 | 0 | 1 | 6 | 2 | 2 | 0 | 2 | 2 | 15 | 1.5 |
| Projectile pts. type 2 | 4 | 2 | 3 | 1 | 2 | 2 | 4 | 2 | 20 | 2.0 |
| Projectile pts. type 3 | 0 | 0 | 5 | 2 | 0 | 3 | 5 | 2 | 17 | 1.7 |
| Projectile pts. type 4 | 5 | 9 | 10 | 7 | 10 | 3 | 1 | 6 | 51 | 5.1 |
| Projectile pts. type 5 | 2 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 5 | 0.5 |
| Scrapers, type 1 | 3 | 4 | 4 | 4 | 3 | 1 | 0 | 2 | 21 | 2.1 |
| Scrapers, type 2 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 0.3 |
| Scrapers, type 3 | 1 | 2 | 3 | 3 | 1 | 2 | 0 | 2 | 14 | 1.4 |
| Scrapers, type 4 | 9 | 6 | 7 | 8 | 4 | 2 | 2 | 8 | 46 | 4.6 |
| Scrapers, type 5 | 1 | 1 | 3 | 2 | 2 | 1 | 2 | 2 | 14 | 1.4 |
| Scrapers, type 6 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 4 | 0.4 |
| Scrapers, type 7 | 0 | 1 | 0 | 2 | 0 | 0 | 1 | 0 | 4 | 0.4 |
| Scrapers, type 8 | 1 | 1 | 0 | 6 | 2 | 3 | 2 | 5 | 20 | 2.0 |
| Scrapers, type 9 | 1 | 2 | 0 | 4 | 1 | 1 | 0 | 4 | 13 | 1.3 |
| Scraper-spokeshaves | 0 | 2 | 2 | 2 | 2 | 0 | 0 | 1 | 9 | 0.9 |
| Spokeshaves | 3 | 2 | 3 | 3 | 0 | 0 | 2 | 1 | 14 | 1.4 |
| Drills or awls | 0 | 1 | 0 | 2 | 0 | 1 | 0 | 0 | 4 | 0.4 |
| Bifaces-complete | 0 | 1 | 2 | 5 | 2 | 1 | 0 | 3 | 14 | 1.4 |
| Bifaces-fragments | 4 | 7 | 6 | 8 | 4 | 4 | 4 | 6 | 43 | 4.3 |
| Pointed bifaces | 1 | 1 | 1 | 1 | 5 | 1 | 1 | 1 | 12 | 1.2 |
| Unifaces-complete | 0 | 1 | 2 | 3 | 2 | 0 | 1 | 3 | 12 | 1.2 |
| Unifaces-fragments | 1 | 3 | 7 | 6 | 3 | 1 | 1 | 3 | 25 | 2.5 |
| Flake tool, type 1 | 5 | 3 | 3 | 7 | 2 | 4 | 0 | 8 | 32 | 3.2 |
| Flake tool, type 2 | 6 | 18 | 17 | 14 | 10 | 12 | 10 | 12 | 99 | 9.9 |
| Flake tool, type 3 | 11 | 19 | 8 | 14 | 10 | 9 | 8 | 14 | 93 | 9.3 |
| Flake tool, type 4 | 32 | 16 | 23 | 23 | 30 | 25 | 20 | 21 | 190 | 19.1 |
| Flake tool, type 5 | 11 | 9 | 7 | 12 | 5 | 5 | 2 | 6 | 57 | 5.7 |
| Microblades | 0 | 1 | 1 | 0 | 0 | 1 | 3 | 0 | 6 | 0.6 |
| Cores | 2 | 3 | 3 | 2 | 2 | 1 | 2 | 5 | 20 | 2.0 |
| Hammerstones | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0.2 |
| Split pebble tools | 3 | 3 | 5 | 0 | 4 | 1 | 2 | 2 | 20 | 2.0 |
| Special tools | 0 | 0 | 2 | 3 | 3 | 1 | 2 | 0 | 11 | 1.1 |
| Chopping tools | 3 | 2 | 0 | 3 | 2 | 0 | 1 | 1 | 12 | 1.2 |
| Ochre | 1 | 0 | 2 | 8 | 3 | 0 | 0 | 2 | 16 | 1.6 |
| Possible tools | 0 | 2 | 5 | 4 | 2 | 3 | 2 | 0 | 18 | 1.8 |
| Bone tools | 3 | 4 | 1 | 0 | 0 | 0 | 3 | 2 | 13 | 1.3 |
| Pottery | 17 | 3 | 0 | 0 | 0 | 0 | 0 | 5 | 25 | 2.5 |
| Pipes | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 3 | 0.3 |
| Total | 133 | 133 | 142 | 164 | 118 | 88 | 83 | 136 | 997 | |
| % | 13.3 | 13.3 | 14.3 | 16.5 | 11.8 | 8.8 | 8.3 | 13.7 | | 100.0 |

# APPENDIX E. DATA ON PROJECTILE POINTS

Note: Numbers in brackets indicate actual measure of broken point.

| Type | Cat. No. | L | W | T | Material | Square | Lev. | Comment |
|---|---|---|---|---|---|---|---|---|
| TYPE 1: Lanceolate, sub-lanceolate | | | | | | | | |
| 1a | 563 | (3.8+) | 2.2 | 0.6 | Chert | Bn | G | Tip & one "ear" missing |
| 1a | 557 | (3.3+) | 2.4 | 0.6 | Quartzite | Aen | G | Tip missing |
| 1b | 6 | 2.6 | 1.7 | 0.5 | Chert | L | E | |
| 1b | 13 | 2.9 | 1.6 | 0.4 | Clay iron-stone | J | E | One ear missing |
| 1b | 590 | (3.4+) | 2.0 | 0.8 | Mudrock | Unassigned | | Tip missing |
| 1b | 168 | (2.1+) | 2.0 | 0.5 | Mudrock | F | D | Tip missing |
| 1b | 36 | (2.0+) | 1.4 | 0.3 | Quartzite | H | D | Tip & one ear missing |
| 1b | 56 | 4.2 | (1.7+) | 0.5 | Quartzite | Unassigned | | Part one side missing |
| 1b | 550 | 3.7 | 2.0 | 0.4 | Chert | Bn | C | One ear missing |
| 1b | 29 | 3.4 | 1.4 | 0.4 | Quartzite | F | C | |
| 1b | 685 | (2.7+) | 2.6 | 0.4 | Mudrock | Aen | C | Tip missing |
| 1b | 8 | 4.0 | 1.9 | 0.5 | Murdock | I | C | |
| 1b | 531 | (1.5+) | 1.4 | 0.4 | Chert | A3e | C | Tip missing |
| 1b | 10 | 2.2 | 1.6 | 0.5 | Chert | D | C | |
| 1b | 500 | (2.2+) | 1.6 | 0.6 | Quartzite | B | B | Tip missing |
| TYPE 2: Stemmed | | | | | | | | |
| 2a | 558 | (1.7+) | (2.3+) | 0.5 | Chalcedony | Aen | G | Base only |
| 2a | 568 | 3.7 | 2.6 | 0.6 | Knife River "flint" | An | G | |
| 2a | 556 | (3.1+) | 2.4 | 0.7 | Quartzite | A2en | A | Resharpened |
| 2b | 49 | (1.1+) | (1.6+) | 0.4 | Knife River "flint" | G | G | Base only |
| 2b | 58 | (2.3+) | 2.2 | 0.7 | Chalcedony | P | C | Tip missing |
| 2b | 89 | 3.1 | 2.1 | 0.6 | Quartzite | Unassigned | | |
| 2b | 523 | (1.2+) | (1.7+) | 0.5 | Quartzite | A2e | B | Tip missing |
| 2b | 534 | (2.1+) | (2.1+) | 0.5 | Mudrock | A4e | A | Tip missing |
| 2c | 73 | 2.6 | 1.8 | 0.6 | Quartzite | Ae | G | |
| 2c | 26 | 1.6 | 1.4 | 0.5 | Quartzite | A | F | |
| 2c | 540 | (3.3+) | 1.9 | 0.5 | Mudrock | A2e | F | Tip missing |
| 2c | 83 | (0.6+) | 1.5 | (0.3+) | Chert | N | E | Base only |
| 2c | 23 | 2.4 | 1.5 | 0.5 | Chert | Ae | E | |
| 2c | 62 | (1.8+) | (2.4+) | 0.5 | Quartzite | Unassigned | | Tip missing |
| 2c | 79 | (0.9+) | 1.9 | 0.5 | Quartzite | I | D | Base only |
| 2c | 20 | (3.3+) | 2.1 | 0.7 | Quartzite | B | C | Tip missing |
| 2c | 543 | 3.1 | 2.1 | 0.4 | Quartzite | Bn | C | |
| 2c | 68 | (0.8+) | (1.4+) | 0.5 | Chalcedony | O | B | Base only |
| 2c | 80 | (1.1+) | (2.1+) | 0.6 | Quartzite | N | A | Base only |
| 2c | 587 | (0.8+) | (1.6+) | 0.4 | Quartzite | Bn | A | Base only |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| TYPE 3: | Corner-notched | | | | | | | |
| 3a | 65 | (1.4+) | (2.0+) | 0.5 | Chalcedony | P | G | Tip missing |
| 3a | 74 | (3.6+) | 2.1 | 0.5 | Quartzite | Ae | G | Tip & part of base missing |
| 3a | 564 | (3.5+) | 2.1 | 0.8 | Quartzite | Bn | G | Tip missing |
| 3a | 561 | (4.4+) | 2.5 | 0.7 | Mudrock | A2en | G | Tip missing |
| 3a | 64 | (2.7+) | 1.9 | 0.6 | Quartzite | P | G | Tip missing |
| 3a | 71 | (1.0+) | (1.6+) | 0.5 | Chalcedony | N | F | Tip missing |
| 3b | 553 | (2.5+) | 1.8 | 0.4 | Quartzite | A2en | F | Part of base missing |
| 3b | 566 | 2.5 | (1.9+) | 0.5 | Quartzite | Bn | F | Part of side missing |
| 3c | 535 | (1.0+) | 2.0 | 0.5 | Quartzite | A2e | C | Tip missing |
| 3c | 529 | (2.6+) | 2.1 | 0.5 | Chert | Aen | C | Tip missing |
| 3c | 547 | (1.4+) | 2.4 | 0.5 | Chalcedony | A5e | C | Tip missing |
| 3c | 48 | (1.2+) | (2.4+) | 0.6 | Quartzite | B | C | Tip missing |
| 3c | 76 | (2.6+) | 2.7 | 0.6 | Quartzite | N | C | Tip missing |
| 3c | 2 | (2.3+) | 2.0 | 0.5 | Chert | Unassigned | | Tip missing |
| 3d | 59 | 2.5 | 1.7 | 0.5 | Chert | Unassigned | | |
| 3d | 32 | 3.2 | 1.7 | 0.5 | Mudrock | A | D | |
| 3d | 35 | (2.6+) | 1.7 | 0.4 | Quartzite | D | D | Tip missing |
| TYPE 4: | Side-notched | | | | | | | |
| 4a | 57 | 4.3 | 2.5 | 0.7 | Mudrock | N | G | |
| 4a | 75 | 3.1 | 2.2 | 0.4 | Mudrock | F | F | |
| 4a | 69 | (2.3+) | (1.7+) | 0.4 | Chert | O | E | Tip & part one side missing |
| 4a | 63 | (0.9+) | (2.0+) | (0.4+) | Quartzite | N | E | Base only |
| 4a | 16 | 2.8 | 2.0 | 0.5 | Mudrock | K | E | |
| 4a | 555 | 5.3 | 2.4 | 0.5 | Chert-chalce-dony | A2en | E | |
| 4a | 33 | (2.8+) | 1.5 | 0.5 | Clay iron-stone | K | D | Tip missing |
| 4a | 562 | 3.8 | 2.4 | 0.5 | Mudrock | A2en | D | |
| 4a | 559 | (1.2+) | (2.1+) | (0.5+) | Quartzite | A2en | D | Tip & part base missing |
| 4a | 24 | 2.8 | 1.8 | 0.4 | Quartzite | Ae | D | |
| 4a | 4 | (3.4+) | 2.2 | 0.6 | Quartzite | L | C | Tip & one "ear" missing |
| 4a | 70 | (1.8+) | (2.2+) | (0.4+) | Mudrock | O | C | Tip & one "ear" missing |
| 4a | 532 | (1.8+) | (1.8+) | 0.4 | Chert | A2e | C | Tip and side missing |
| 4a | 530 | 4.8 | 2.3 | 0.5 | Chalcedony | A2e | C | |
| 4a | 30 | 3.1 | 2.0 | 0.5 | Chert | K. | B | Part one ear missing |
| 4a | 7 | (4.0+) | 2.2 | 0.6 | Quartzite | D | B | Tip missing |
| 4a | 509 | 2.9 | 2.1 | 0.4 | Mudrock | A4e | A | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 4b | 54 | 3.4 | 2.0 | 0.5 | Chert | Unassigned | | |
| 4b | 591 | (1.1+) | (1.7+) | (0.6+) | Quartzite | Unassigned | | Tip missing |
| 4b | 43 | (0.9+) | (1.9+) | 0.4 | Chert-chal-cedony | A | F | Tip missing |
| 4b | 21 | (1.1+) | (1.7+) | 0.4 | Chert | Ae | F | Tip missing |
| 4b | 538 | (2.9+) | 1.8 | 0.4 | Quartzite | Aen | E | Tip missing |
| 4b | 28 | 2.7 | 1.5 | 0.4 | Knife River "flint" | K | E | |
| 4b | 536 | (0.7+) | (2.0+) | (0.5+) | Chert | A2e | D | Base only |
| 4b | 27 | (2.4+) | 1.8 | 0.5 | Quartzite | J | E | Tip missing |
| 4b | 66 | (2.2+) | 2.1 | 0.6 | Quartzite | C | E | Tip missing |
| 4b | 31 | (2.3+) | 1.8 | 0.5 | Chert | D | D | Tip missing |
| 4b | 11 | 2.8 | 1.9 | 0.6 | Chert | Ae | D | |
| 4b | 554 | (2.2+) | 1.6 | 0.4 | Mudrock | A2en | C | Tip missing |
| 4b | 12 | (2.9+) | 2.0 | 0.6 | Quartzite | P | B | Tip missing |
| 4c | 593 | (3.2+) | 1.9 | 0.6 | Pet. wood | Unassigned | | Tip missing |
| 4c | 582 | (1.3+) | (2.0+) | 0.6 | Quartzite | Unassigned | | Tip missing |
| 4c | 19 | (2.4+) | (2.7+) | 0.4 | Quartzite | H | C | Part tip and side missing |
| 4c | 14 | 2.6 | 1.9 | 0.6 | Chert | M | C | One ear missing |
| 4c | 533 | 2.8 | 1.9 | 0.6 | Knife River "flint" | Aen | C | |
| 4c | 17 | (2.5+) | 2.0 | 0.5 | Chert | Ae | B | Tip missing |
| 4d | 15 | (2.6+) | 1.6 | 0.5 | Mudrock | J | E | Tip missing |
| 4d | 1 | (1.9+) | 1.6 | 0.6 | Quartzite | D | D | Tip missing |
| 4d | 34 | 2.2 | 1.5 | 0.6 | Quartzite | N | C | |
| 4d | 541 | 2.9 | 1.8 | 0.4 | Quartzite | A4e | B | |
| 4d | 546 | (1.9+) | 1.5 | 0.5 | Quartzite | A5e | B | Tip missing |
| 4d | 84 | (0.9+) | (1.4+) | 0.4 | Quartzite | A | B | Base only |
| 4e | 549 | (1.7+) | 1.4 | 0.3 | Chert | Bn | C | Tip missing |
| 4e | 508 | 2.3 | 1.3 | 0.4 | Chert | A2e | B | |
| 4e | 510 | 2.0 | 1.5 | 0.4 | Chert | A5e | A | |
| 4e | 514 | 1.7 | 1.4 | 0.3 | Quartzite | A2e | B | |
| 4e | 565 | 2.2 | 1.2 | 0.4 | Quartzite | Unassigned | | Part base missing |
| 4e | 90 | 2.2 | 1.5 | 0.3 | Quartzite | Unassigned | | Part base missing |
| 4e | 525 | (1.5+) | (1.1+) | 0.3 | Knife River "flint" | A2e | B | Tip and side missing |
| 4e | 503 | (1.3+) | 1.4 | 0.2 | Chert | A3e | A | Mid-section only |
| 4e | 544 | 2.5 | 1.3 | 0.3 | Chert | A2en | A | |

TYPE 5: Ovoid

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 5 | 9 | (2.3+) | 2.2 | 0.5 | Mudrock | I | D | Tip missing |
| 5 | 5 | 3.3 | 2.2 | 0.7 | Quartzite | D | B | |
| 5 | 18 | 3.1 | 2.2 | 0.6 | Quartzite | G | A | |
| 5 | 3 | 4.1 | 2.2 | 0.8 | Quartzite | Unassigned | | |
| 5 | 512 | 2.6 | 1.6 | 0.4 | Pet. wood | A | A | |

APPENDIX F. FAUNAL SPECIES BY LEVELS

| LEVELS | A | B | C | D | E | F | G | TOTAL | % |
|---|---|---|---|---|---|---|---|---|---|
| Bison | 19 | 29 | 40 | 44 | 36 | 15 | 15 | 198 | 58.5 |
| Moose | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 2 | 0.6 |
| Large unidentified ungulate | 22 | 27 | 27 | 19 | 16 | 9 | 8 | 128 | 37.9 |
| Deer | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0.3 |
| Elk | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0.3 |
| Canids | 0 | 2 | 0 | 0 | 1 | 0 | 1 | 3 | 0.9 |
| Beaver | 1 | 2 | 0 | 1 | 1 | 0 | 0 | 5 | 1.5 |
| Total | 43 | 61 | 67 | 65 | 54 | 24 | 24 | 338 | |
| % | 12.7 | 18.0 | 19.9 | 19.2 | 16.0 | 7.1 | 7.1 | | 100.0 |

APPENDIX G. FAUNAL SKELETAL PARTS BY LEVELS (BISON, LARGE UNIDENTIFIED UNGULATES, MOOSE, ELK, DEER)

| LEVELS | A | B | C | D | E | F | G | TOTAL | % |
|---|---|---|---|---|---|---|---|---|---|
| Skull | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0.6 |
| Mandible | 2 | 1 | 2 | 3 | 2 | 1 | 1 | 12 | 6.7 |
| Vertebra | 4 | 0 | 1 | 1 | 2 | 0 | 1 | 9 | 5.0 |
| Scapula | 0 | 0 | 3 | 5 | 1 | 1 | 0 | 10 | 5.6 |
| Pelvis | 1 | 3 | 5 | 4 | 6 | 1 | 1 | 21 | 11.7 |
| Humerus, proximal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 |
| Humerus, distal | 2 | 3 | 2 | 4 | 0 | 1 | 1 | 13 | 7.3 |
| Radius, proximal | 1 | 1 | 0 | 2 | 2 | 0 | 0 | 6 | 3.4 |
| Radius, distal | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 4 | 2.2 |
| Ulna | 0 | 2 | 4 | 2 | 0 | 0 | 0 | 8 | 4.4 |
| Metacarpal, proximal | 0 | 1 | 3 | 1 | 2 | 0 | 1 | 8 | 4.4 |
| Metacarpal, distal | 0 | 2 | 3 | 3 | 0 | 0 | 0 | 8 | 4.4 |
| Femur, proximal | 1 | 1 | 1 | 2 | 0 | 0 | 1 | 6 | 3.4 |
| Femur, distal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 |
| Tibia, proximal | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 2 | 1.1 |
| Tibia, distal | 2 | 2 | 4 | 5 | 6 | 3 | 0 | 22 | 12.3 |
| Astragalus | 0 | 1 | 1 | 1 | 2 | 0 | 2 | 7 | 3.9 |
| Calcaneus | 2 | 1 | 0 | 1 | 0 | 0 | 0 | 4 | 2.2 |
| Ulnar carpal | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 1.1 |
| Metatarsal, proximal | 0 | 1 | 0 | 3 | 0 | 0 | 0 | 4 | 2.2 |
| Metatarsal, distal | 0 | 0 | 4 | 0 | 0 | 1 | 0 | 5 | 2.8 |
| Phalanges, first | 2 | 3 | 5 | 1 | 1 | 0 | 2 | 14 | 7.8 |
| Phalanges, second | 3 | 0 | 2 | 2 | 2 | 2 | 1 | 12 | 6.7 |
| Phalanges, third | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0.6 |
| TOTAL | 22 | 23 | 40 | 42 | 28 | 12 | 12 | 179 | |
| % | 12.3 | 12.8 | 22.3 | 23.4 | 15.6 | 6.7 | 6.7 | | 99.8 |